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THE UNIVERSITY OF CALIFORNIA

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1894-5


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ANNOUNCEMENT OF COURSES  
OF  
GRADUATE INSTRUCTION

BERKELEY:  
THE UNIVERSITY PRESS

May, 1894

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# THE UNIVERSITY OF CALIFORNIA.

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## COURSES OF GRADUATE INSTRUCTION, 1894-95.

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Advanced instruction, leading to the degrees of Master of Arts (with the corresponding degrees in Letters and Science) and Doctor of Philosophy, is offered by the University of California to graduates of any reputable college or university. If in any case the preliminary training of such students has not been sufficient to qualify them for strictly graduate work, they will be admitted to such undergraduate courses, in the department in which they expect to study, as may be suited to their needs.

The University library contains more than 55,000 volumes, and is admirably adapted, so far as its extent allows, for purposes of advanced study and research. The laboratories are extensive and well equipped, and every facility is afforded for work in the higher lines of Pure and Applied Science. No charge is made for instruction, or the use of the library, and the expenses of living in Berkeley are very moderate.

The present preliminary circular is intended merely to call attention to the opportunities for graduate work offered by this University. Fuller information in regard to the requirements for the higher degrees, or upon other points, may be obtained by addressing the heads of the different departments (see list of faculties and courses of instruction), or any of the members of the Committee on Graduate Study, as follows :

IRVING STRINGHAM,  
BERNARD MOSES,  
CHARLES MILLS GAYLEY,  
EDWARD BULL CLAPP,  
ANDREW COWPER LAWSON,

University of California, Berkeley.

# FACULTIES AND COURSES OF INSTRUCTION.

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## PHILOSOPHY.

- GEORGE H. HOWISON, A.M., LL.D. (Marietta),  
*Mills Professor of Intellectual and Moral Philosophy and Civil Polity.*
- \*GEORGE M. STRATTON, A.M. (Yale),  
*Instructor in Philosophy.*
- ERNEST NORTON HENDERSON, A.M.,  
*Fellow in Philosophy.*
- OLIVER BRIDGES HENSHAW, A.B. (Harvard). A.M.  
*Fellow in Philosophy.*

### Primarily for Graduates.

1. The Philosophy of Plato.  
Professor HOWISON.
2. Hegel's Logic.  
Professor HOWISON.

### For Graduates and advanced Undergraduates.

3. The Philosophy of Kant.  
Professor HOWISON.
4. Ethics and Civil Polity.  
Professor HOWISON.

\*Absent on leave, in Europe.

## PEDAGOGY.

- ELMER E. BROWN, A.B. (Michigan), PH.D. (Halle),  
*Professor of the Science and Art of Teaching.*
- CALVIN N. KENDALL, A.M. (Hamilton),  
*Instructor in Pedagogy.*

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*Fellow in Pedagogy.*

### Primarily for Graduates.

1. Graduate Seminary for the systematic study of Child-life.  
Sessions to be held in San Francisco, at a convenient hour.  
Professor BROWN.

### For Graduates and advanced Undergraduates.

2. History of Education.  
Professor BROWN.
3. Theory of Education.  
Professor BROWN.
4. School Systems.  
Professor BROWN.
5. Special Problems in Education.  
Professor BROWN.

## HISTORY AND POLITICAL SCIENCE.

BERNARD MOSES, PH.D. (Heidelberg),  
*Professor of History and Political Economy.*

WILLIAM CAREY JONES, A.M.  
*Professor of Jurisprudence.*

THOMAS R. BACON, A.B. (Yale),  
*Associate Professor of European History.*

CARL C. PLEHN, A.B. (Brown), PH.D. (Göttingen),  
*Assistant Professor of Economic History and Finance.*

F. E. HAYNES, PH.D. (Harvard),  
*Instructor in United States History.*

CLARENCE W. LEACH, PH.B.,  
*Fellow in Political Economy.*

### Primarily for Graduates.

- |                                       |                  |
|---------------------------------------|------------------|
| 1. Economical and Political Seminary. | Professor MOSES. |
| 2. History of Political Theories.     | Professor MOSES. |
| 3. Science of Politics.               | Professor MOSES. |
| 4. Studies in Comparative Law.        | Professor JONES. |

### For Graduates and advanced Undergraduates.

- |   |                            |
|---|----------------------------|
| 5. Spanish-American History and Institutions.   | Professor MOSES.           |
| 6. Constitutional Law of the United States.     | Professor JONES.           |
| 7. Cases in International Law.                  | Professor JONES.           |
| 8. Jurisprudence.                               | Professor JONES.           |
| 9. Political History of the Nineteenth Century. | Associate Professor BACON. |
| 10. Local Government and Administration.        | Assistant Professor PLEHN. |
| 11. Finance and Taxation.                       | Assistant Professor PLEHN. |

Fifteen other advanced undergraduate courses in History and Political Science.

## SEMITIC LANGUAGES AND LITERATURE.

JACOB VOORSANGER, D.D.,

*Professor of the Semitic Languages and Literature.*

In establishing this department, it is the intention of the University to offer elementary and advanced instruction in Hebrew, Aramaic, Assyrian, Arabic, and the cognate languages, suitable for special students of Semitic philology, as well as for those who intend to pursue theological studies. In 1894-95, however, but one course will be given, of four hours weekly, in the Elements of Hebrew. The more advanced courses will be added in succeeding years.

## CLASSICAL PHILOLOGY.

MARTIN KELLOGG, LL.D. (Yale), PRESIDENT OF THE UNIVERSITY.

*\*Professor of the Latin Language and Literature.*

EDWARD BULL CLAPP, PH.D. (Yale),

*Professor of the Greek Language and Literature.*

ISAAC FLAGG, A.B. (Harvard), PH.D. (Göttingen),

*Associate Professor of Classical Philology.*

GEORGE MOREY RICHARDSON, A.B. (Harvard), PH.D. (Leipzig),

*Associate Professor of Classical Archæology.*

LEON J. RICHARDSON, A.B. (Michigan),

*Instructor in Latin.*

### Primarily for Graduates.

- |                                    |                                 |
|------------------------------------|---------------------------------|
| 1. Greek Seminary.                 | Professor CLAPP.                |
| 2. Latin Seminary.                 | _____.                          |
| 3. Sophocles, Plays and Fragments. | Associate Professor FLAGG.      |
| 4. The Republic of Plato.          | Professor CLAPP.                |
| 5. Ancient Italian Dialects.       | _____.                          |
| 6. Greek and Roman Bucolic Poetry. | Associate Professor RICHARDSON. |
| 7. Roman Satire.                   | Associate Professor RICHARDSON. |

Also seventeen advanced undergraduate courses in Classical Philology and Archæology.

\*This chair is to be filled by a new appointment.

## ENGLISH.

CHARLES MILLS GAYLEY, A.B. (Michigan),  
*Professor of the English Language and Literature.*

CORNELIUS B. BRADLEY, A.M. (Oberlin),  
*Professor of Rhetoric.*

ALEXANDER F. LANGE, PH.D. (Michigan),  
*Assistant Professor of English.*

WILLIAM D. ARMES, PH.B.,  
*Instructor in English.*

LOUIS DU PONT SYLE, A.M. (Yale),  
*Instructor in English.*

THOMAS F. SANFORD, A.B. (Yale),  
*Instructor in English.*

### Primarily for Graduates.

1. English Philology: (*a*) Old Icelandic; (*b*) Beowulf; (*c*) First Modern English. Three courses.

Assistant Professor LANGE.

2. German Influence on English Literature.

Assistant Professor LANGE.

3. The Relation of English Literature to the Mediæval Spirit.

Professor BRADLEY.

4. History of Aesthetic Theory.

Professor GAYLEY.

5. Courses of Research: according to the needs of individual students.

Also nineteen advanced undergraduate courses in Rhetoric and Criticism, English Literature, and Philology, open to such graduates as require further preliminary training.

## GERMAN.

ALBIN PUTZKER, A.M. (Knox),  
*Professor of the German Language and Literature.*

J. HENRY SENGEL, PH.D.,  
*Assistant Professor of German.*

HENRY E. G. ONGERTH,  
*Reader in German.*

### Primarily for Graduates.

1. German Literature.

Professor PUTZKER.

2. History of the German Language.

Professor PUTZKER.

### For Graduates and advanced Undergraduates.

3. Old and Middle High German.

Assistant Professor SENGEL.

4. Gothic.

Assistant Professor SENGEL.

5. Lessing.

Professor PUTZKER.

Five other advanced undergraduate courses.

## ROMANCE LANGUAGES.

F. V. PAGET, Bachelier ès Lettres, Bachelier ès Sciences (University of France).  
*Professor of the French and Spanish Languages.*

S. D. HUNTINGTON, A.B. (Wisconsin),  
*Instructor in French and Italian.*

C. S. H. HOWARD,  
*Fellow in French.*

### For Graduates and advanced Undergraduates.

1. Comparative Syntax and Study of Old Texts.  
Professor PAGET.
2. Morphology.  
Professor PAGET.
3. Dante's *La Divina Commedia*.  
Professor PAGET.
4. Don Quijoté.  
Professor PAGET.
5. French Literature of the Seventeenth Century.  
Professor PAGET.
6. Victor Hugo's Poetry.  
Mr. HUNTINGTON.

Seventeen other advanced undergraduate courses.

## MATHEMATICS.

IRVING STRINGHAM, A.B. (Harvard), PH.D. (Johns Hopkins),  
*Professor of Mathematics.*

GEORGE C. EDWARDS, PH.B.,  
*Associate Professor of Mathematics.*

MELLEN W. HASKELL, A.M. (Harvard), PH.D. (Göttingen),  
*Associate Professor of Mathematics.*

ARMIN O. LEUSCHNER, A.B. (Michigan),  
*Assistant Professor of Mathematics.*

ARCHIE B. PIERCE, A.M. (Harvard),  
*Instructor in Mathematics.*

LOUIS T. HENGSTLER, PH.D.,  
*Instructor in Mathematics.*

### Primarily for Graduates.

1. Mathematical Seminary.  
Professor STRINGHAM.
2. Theory of Substitutions.  
Associate Professor HASKELL.
3. Theory of Numbers.  
Associate Professor HASKELL.
4. Absolute Geometry.  
Professor STRINGHAM.
5. Quaternions.  
Mr. PIERCE.
6. Theory of Functions of Real Variables.  
Professor STRINGHAM.
7. Differential Equations.  
Associate Professor EDWARDS.

Also seventeen advanced undergraduate courses.



## PHYSICS.

FREDERICK SLATE, B.S. (Brooklyn Polytechnic),  
*Professor of Physics.*

HAROLD WHITING, PH.D. (Harvard),  
*Associate Professor of Physics.*

W. J. RAYMOND, B.S.,  
*Instructor in Physics.*

E. R. DREW, B.S.,  
*Instructor in Physics.*

GEORGE D. SONES, B.S. (Michigan),  
*Assistant in Physics.*

L. F. CHESEBROUGH,  
*Mechanician to the Department.*

### Primarily for Graduates.

1. Special Research in Color and Light.  
Associate Professor WHITING and Mr. RAYMOND.
2. Dynamics of Rotation. Stresses and Strains in Elastic Solids.  
Professor SLATE.
3. Historical Development of Physical Theories.  
Professor SLATE.

### For Graduates and advanced Undergraduates.

4. Absolute Electrical Measurements.  
Mr. RAYMOND.
  5. Harmonic Motion.  
Mr. RAYMOND.
  6. Lectures and Laboratory Exercises in Sound.  
Associate Professor WHITING.
- Eight other advanced undergraduate courses.

## ASTRONOMY.

### LICK OBSERVATORY.

EDWARD S. HOLDEN, A.M. (Washington University), LL.D. (Wisconsin,  
*Director and Astronomer.* [Columbia],

GEORGE DAVIDSON, PH.D., S.D.,  
*Honorary Professor of Geodesy and Astronomy.*

JOHN M. SCHAEFERLE, C.E. (Michigan),  
*Astronomer.*

EDWARD E. BARNARD, A.M. (University of the Pacific), Sc.D. (Vanderbilt),  
*Astronomer.*

WILLIAM W. CAMPBELL, B.S. (Michigan),  
*Astronomer.*

R. H. TUCKER, JR., C.E. (Lehigh University),  
*Astronomer.*

ALLEN L. COLTON, A.B., PH.B. (Michigan),  
*Assistant Astronomer.*

The Lick Astronomical Observatory on Mount Hamilton forms a

separate department of the University. The unrivalled facilities for advanced astronomical work which are afforded by the great telescope, in this favorable location, are too well known to require description here. The Department is open to graduate students under regulations prescribed by the Regents (see the REGISTER for 1892-3, p. 113). The degrees of Master of Science and Doctor of Philosophy are offered to students who have fulfilled the required conditions. A few special students, of mature age and with the proper preparation, are received during the summer. For information relating to graduate work at the Observatory intending students should address the Recorder of the University at Berkeley, or the Director of the Lick Observatory, Mount Hamilton P. O., Santa Clara County.

#### STUDENTS' OBSERVATORY, AT BERKELEY.

FRANK SOULÉ (Graduate of United States Military Academy),  
*Professor of Civil Engineering and Astronomy.*

ARMIN O. LEUSCHNER, A.B. (Michigan),  
*Assistant Professor of Mathematics.*

L. E. HUNT, B.S.,  
*Assistant in Astronomy.*

For graduate students not yet sufficiently mature to engage in the higher work at the Lick Observatory, excellent facilities for the study of practical and theoretical Astronomy are offered in connection with the Students' Observatory at Berkeley. The following advanced courses are offered:

- |  |                                |
|--|--------------------------------|
| 1. Practice in Observing.                | Assistant Professor LEUSCHNER. |
| 2. History of Astronomy.                 | Assistant Professor LEUSCHNER. |
| 3. Method of Least Squares.              | Assistant Professor LEUSCHNER. |
| *4. Mechanical Quadratures.              | Assistant Professor LEUSCHNER. |
| *5. Interpolation and the Use of Tables. | Assistant Professor LEUSCHNER. |

\*Given in alternate years.

## CHEMISTRY.

W. B. RISING, A.M., M.F. (Hamilton), Ph.D. (Heidelberg),  
*Professor of Chemistry.*

EDMOND O'NEILL, Ph.B.,  
*Assistant Professor of Organic and Physiological Chemistry.*

W. J. SHARWOOD, A.R.S.M. (London),  
*Instructor in Chemistry.*

W. C. BLASDALE, B.S.,  
*Assistant in Chemistry.*

R. S. NORRIS, B.S.,  
*Assistant in Chemistry.*

VICTOR LEHNER, B.S.,  
*Assistant in Chemistry.*

Graduate Courses are offered in the following subjects:

1st—In Advanced Analytical Chemistry.

(a) Micro-chemical Analysis.

(b) Special separations in Quantitative Analysis.

(c) Special Analyses of minerals, mineral waters, etc., etc.

2nd—In the study of special topics from the Inorganic Chemistry. Students will be assigned special subjects of study and receive guidance and assistance in their work.

3rd—In special topics in Technical Chemistry.

Special mention may be made of the analyses of Iron and Steel. The subject of Explosives will also receive attention, and good facilities will be offered for their investigation, analyses, etc.

4th—In Organic Chemistry, including the preparation of organic compounds, and advanced work in Physiological Chemistry. Special attention is drawn to the opportunities for original work in Animal and Vegetable Chemistry, particularly in the investigation of the indigenous plants of the State. A number of such investigations have been begun and have opened a wide field of research.

5th—In sanitary examinations and food analyses, etc., etc.

The State Analyst's Office presents exceptional opportunities for study and investigation in the field of food adulteration. A few private assistants will be received in the State Analyst's Office and will be allowed to give assistance in the practical work of the Laboratory.

Also seventeen advanced undergraduate courses.

## BOTANY.

EDWARD L. GREENE, PH.B. (Albion),  
*Professor of Botany.*

MARSHALL A. HOWE, PH.B. (Vermont),  
*Instructor in Cryptogamic Botany.*

WILLIS L. JEPSON, PH.B.,  
*Assistant in Botany.*

### Primarily for Graduates.

1. Systematic Critical Studies in Cryptogamous Plants, for which California offers a unique field.

Mr. HOWE.

2. Histological and Embryological Studies in the Higher Cryptogamia.

Mr. HOWE.

3. Economic Botany.

Professor GREENE.

4. History of Botany, with special research in the instructor's extensive library of early botanical works.

Professor GREENE.

### For Graduates and advanced Undergraduates.

5. The Phanerogamic Natural Orders.

Professor GREENE.

6. Vegetable Histology.

Mr. HOWE.

8. Medical Botany.

Professor GREENE.

9. Advanced Systematic Botany.

Professor GREENE.

## ZOOLOGY.

Owing to Assistant Professor RITTER's absence in Europe, no regular graduate courses will be given during the year 1894-95. However, this department places special emphasis on the higher lines of work; and for students already pursuing advanced study, as well as for any others who may be desirous of entering upon such a course, special lines of laboratory work, and of reading, will be laid out, and the results accomplished will be reviewed and criticised from time to time, both by the instructor in charge and by Professor RITTER by correspondence.

Through the summer school at the sea side during the past two years, and the collecting expedition of the summer vacation, a considerable quantity of material from our marine fauna is available for different lines of investigation, and no effort will be spared to encourage and assist advanced students who may be able and willing to enter this field of scientific work.

## GEOLOGY AND MINERALOGY.

JOSEPH LECONTE, A.M. (Georgia), M.D. (New York), B.S. (Harvard), I.L.D.  
*Professor of Geology and Natural History.* [(Georgia),

ANDREW C. LAWSON, A.B. (Toronto), PH.D. (Johns Hopkins),  
*Associate Professor of Geology and Mineralogy.*

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*Instructor in Paleontology.*

F. LESLIE RANSOME, B.S.,  
*Fellow in Geology.*

There is probably nowhere a more inviting field for geological research than that which lies immediately at the gates of the University of California. The problems presented both in physical and in organic geology are varied and interesting in the extreme. It is the policy of the department to encourage advanced students to engage in the work of investigating this field, and so contribute to the elucidation of Californian geology.

The facilities for such work are ample. The region adjacent to the Bay of San Francisco, from latitude  $37^{\circ} 30'$  northward, is being mapped topographically by the United States Geological Survey, and very excellent contour maps are becoming available as the work proceeds. These maps are made the basis for instruction in geological cartography. The geological and mineralogical laboratories are well equipped for research work, and new apparatus and appliances are being added yearly.

The active progress of research work during the past few years has led to the establishment of a BULLETIN OF THE DEPARTMENT OF GEOLOGY of which the following four numbers have been issued:—

- No. 1. The Geology of Carmelo Bay, by Andrew C. Lawson, with chemical analyses and coöperation in the field by Juan de la C. Posada.
- No. 2. The Soda Rhyolite North of Berkeley, by Chas. Palache.
- No. 3. The Eruptive Rocks of Point Bonita, by F. Leslie Ransome.
- No. 4. The Post-Pliocene Diastrophism of the Coast of Southern California, by Andrew C. Lawson.

During the year 1894-5, Professor LECONTE will lecture twice a week on the following special topics: Mountain Structure, Organic Evolution in Geology, Quaternary Geology, The Glacial Epoch in California, Genesis of Metalliferous Veins.

Associate Professor LAWSON will conduct graduate work in inorganic geology, including discussions of special topics and advanced problems, critical reviews of current literature, prosecution of geological research with the view to publication of results, methods of geological surveying and cartography, and petrographical studies.

## CIVIL ENGINEERING.

FRANK SOULÉ (Graduate U. S. Military Academy),  
*Professor of Civil Engineering and Astronomy.*

H. I. RANDALL, B.S.,  
*Instructor in Civil Engineering.*

### For Graduates and advanced Undergraduates.

- |   |                  |
|---|------------------|
| 1. Civil Engineering Laboratory.          | Professor SOULÉ. |
| 2. Construction of Dams.                  | Professor SOULÉ. |
| 3. Water Supply Systems.                  | Professor SOULÉ. |
| 4. Irrigation and Drainage.               | Professor SOULÉ. |
| 5. Sewer Systems.                         | Professor SOULÉ. |
| 6. Railroad Economics.                    | Mr. RANDALL.     |
| 7. Railroad Field Practice and Mapping.   | Mr. RANDALL.     |
| Six other advanced undergraduate courses, |                  |

## MECHANICAL ENGINEERING.

F. G. HESSE (Graduate of Gewerbe Institut, Treves),  
*Professor of Mechanical Engineering.*

FREDERICK SLATE, B.S. (Brooklyn Polytechnic),  
*Professor of Physics.*

CLARENCE L. CORY, M.M.E. (Cornell),  
*Assistant Professor of Mechanical Engineering.*

J. A. SLADKY,  
*Instructor in Mechanical Practice.*

J. N. LECONTE, M.M.E. (Cornell),  
*Assistant in Mechanics.*

### For Graduates and advanced Undergraduates.

- |  |                           |
|--|---------------------------|
| 1. Analytic Mechanics.                             | Professor SLATE.          |
| 2. Hydrodynamics.                                  | Professor HESSE.          |
| 3. Hydraulics and Hydraulic Machinery.             | Professor HESSE.          |
| 4. Thermodynamics.                                 | Professor HESSE.          |
| 5. Dynamics of Heat Engines.                       | Professor HESSE.          |
| 6. Mechanical Laboratory.                          | Professor HESSE.          |
| 7. Electrical Engineering.                         | Assistant Professor CORY. |
| 9. Mechanical Laboratory. Problems in Electricity. | Assistant Professor CORY. |

## MINING AND METALLURGY.

SAMUEL B. CHRISTY, PH.B.,

*Professor of Mining and Metallurgy.*

F. BOOTH, B.S.,

*Instructor in Assaying, and Assistant in Metallurgy.*

E. A. HERSAM, B.S. (Massachusetts Institute of Technology),

*Analytical Assistant.*

FRANK RICHARDS,

*Laboratory Helper.*

This department offers twelve courses, including lectures, laboratory and field work in mining, metallurgy, assaying, and ore dressing. These courses are open to properly-qualified seniors and graduate students.

Particular attention is given to the mining and metallurgy of the precious metals, for the study of which California and Nevada offer unequalled advantages. The libraries, museums, and laboratories of the University have been carefully designed to meet the needs of students in this direction, and it is confidently believed that opportunities are offered to students of these subjects which are not to be found elsewhere.

## AGRICULTURE, HORTICULTURE, AND ENTOMOLOGY.

E. W. HILGARD, PH.D. (Heidelberg), LL.D. (Mississippi, Columbia, Michigan),

*Professor of Agriculture, and Agricultural Chemistry.*

E. J. WICKSON, A.M. (Hamilton),

*Associate Professor of Agriculture, Horticulture, and Entomology.*

R. H. LOUGHRIDGE, PH.D. (Mississippi),

*Assistant Professor of Agricultural Geology and Chemistry.*

C. W. WOODWORTH, M.S. (Illinois),

*Assistant Professor of Entomology.*

M. E. JAFFA, PH.B.,

*Instructor in the Agricultural Laboratory.*

G. E. COLBY, PH.B.,

*Instructor in the Viticultural Laboratory.*

A. P. HAYNE, PH.B.,

*Instructor in Viticulture and Olive Culture.*

### For Advanced Students.

#### 1. Chemistry and Physics of Soils.

Professor HILGARD and Assistant Professor LOUGHRIDGE.

#### 2. Agricultural and Viticultural Laboratory.

Mr. JAFFA, Mr. COLBY, and Mr. HAYNE.

#### 3. Economic Entomology.

Assistant Professor WOODWORTH.

#### 4. Entomological Laboratory.

Assistant Professor WOODWORTH.

#### 5. Parasitic Plant Diseases.

Assistant Professor WOODWORTH.





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1895-6

BERKELEY  
The University Press  
*April, 1895*



# UNIVERSITY OF CALIFORNIA.

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## COURSES OF GRADUATE INSTRUCTION, 1895-96.

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Advanced instruction, leading to the degrees of Master of Arts (with the corresponding degrees in Letters and Science) and Doctor of Philosophy, is offered by the University of California to graduates of any reputable college or university. If in any case the preliminary training of such students has not been sufficient to qualify them for strictly graduate work, they will be admitted to such undergraduate courses, in the department in which they expect to study, as may be suited to their needs.

The University library contains about 65,000 volumes, and is admirably adapted, so far as its extent allows, for purposes of advanced study and research. Other libraries, containing about 500,000 volumes in all, are easily accessible and may be used by advanced students. The laboratories are extensive and well equipped, and every facility is afforded for work in the higher lines of pure and applied science. No charge is made for instruction, or the use of the library, and the expenses of living in Berkeley are moderate.

The present circular is intended merely to call attention to the opportunities for graduate work offered by this University. Fuller information in regard to the requirements for the higher degrees, or on other points, may be obtained by addressing the heads of the different departments.

The next academic year of the University begins August 12th, 1895. Graduate students should register at the Recorder's office on Thursday, August 15th.

## DEPARTMENTS AND COURSES OF INSTRUCTION.

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### PHILOSOPHY.

GEORGE H. HOWISON, A.M., LL.D. (Marietta).

*Mills Professor of Intellectual and Moral Philosophy and Civil Polity.*

\*GEORGE M. STRATTON, A.B., A.M. (Vale),

*Instructor in Philosophy.*

ERNEST NORTON HENDERSON, A.M.,

*Fellow in Philosophy.*

OLIVER BRIDGES HENSHAW, A.B. (Harvard), A.M.,

*Fellow in Philosophy.*

#### Primarily for Graduates.

- |                             |                    |
|-----------------------------|--------------------|
| 1. Hegel's Logic.           | Professor HOWISON. |
| 2. The Philosophy of Plato. | Professor HOWISON. |

#### For Graduates and Advanced Undergraduates.

- |                             |                    |
|-----------------------------|--------------------|
| 3. The Philosophy of Kant.  | Professor HOWISON. |
| 4. Ethics and Civil Polity. | Professor HOWISON. |

\*Absent on leave.

### PEDAGOGY.

ELMER E. BROWN, PH.D. (Halle),

*Professor of the Science and Art of Teaching.*

THOMAS P. BAILEY, JR., PH.D. (South Carolina),

*Assistant Professor of the Science and Art of Teaching.*

#### Primarily for Graduates.

1. Biological aspects of Pedagogy, with special reference to physical and mental hygiene. *2 hrs. throughout the year.*

Assistant Professor BAILEY.

2. Graduate seminary for the study of child-life. Sessions to be held in San Francisco, at a convenient hour. *2 hrs. twice a month throughout the year.*

Professor BROWN.

#### For Graduates and Advanced Undergraduates.

3. Theory of Education. *4 hrs. throughout the year.*

Professor BROWN.

4. Seminary for the study of special problems in education. *2 hrs. throughout the year.*

Professor BROWN.

Graduate students will be given special opportunities in connection with the Tompkins Observation School in Oakland.

## JURISPRUDENCE.

WILLIAM CAREY JONES, A.M.,  
*Professor of Jurisprudence.*

### For Graduates.

#### 1. Studies in Comparative Law.

A study of particular branches of the law as they appear in the modern European codes.

The subject offered in 1895-96 will be Criminal Law.

This course will embrace (1) the general principles of criminal law, with a discussion of the various theories held by philosophers and jurists, and their influence on legislation ; (2) a particular study of the Criminal Code of the German Empire, with references to the codes of France, Italy, and India. *2 hrs. first half.* Professor JONES.

### For Graduates and Advanced Undergraduates.

#### 2. Constitutional Law of the United States.

A critical study, along special lines, of the judicial interpretation of our constitutional law, Federal and State.

The method of study employed in this course consists primarily of a first-hand examination of judicial decisions. The Reports of the Supreme Court of the United States constitute the chief source of investigation. Individual members of the class are directed in special lines of inquiry. It is expected that during the course of each year all the more important leading cases decided by the Supreme Court, with full references to succeeding cases, will be reported, commented on, and discussed. Other features of the course are varied from year to year.

For graduate students, who have already taken this course, more advanced work will be provided in the way of special investigation. *2 hrs. throughout the year.* Professor JONES.

#### 3. History of International Law.

A study of the historical development of International Law, in its literature, in treaties, and in special cases.

This course aims to describe the evolution of the relations between independent states. The history of European diplomacy will be traced. The most important of the general European treaties, from the Treaty of Westphalia in 1648 to the Treaty of Berlin in 1878, will be carefully examined. Especial attention will be given to international questions in which the United States has been concerned.

For graduate students, who have already taken this course, more advanced work will be provided, in European or American diplomacy, in the study of special treaties, or in a comparative study of the views and influence of different scientific writers on International Law. *2 hrs. first half.* Professor JONES.

4. Roman Law.

A systematic and historical exposition of the principles of Roman private law.

This course is a prerequisite for courses 1 and 5, and for all graduate work in jurisprudence. The arrangement of the Roman law in this course is according to modern systems of classification. The exposition gives the text of the Institutes of Justinian, and, where any difference exists, that of the Institutes of Gaius. It presents the parts of the Digest and Code that are of use to the student of modern law. It aims to set forth the whole scheme of defining and administering justice as developed by the Romans.

For graduate students, who have already taken this course, more advanced work will be provided, in the way of a minuter study of special titles of the Digest. *4 hrs. first half.*

Professor JONES.

5. Principles of Jurisprudence.

Study of the province and materials of Jurisprudence regarded as the Science of Positive Law.

The object of this course is to present the leading principles of modern private law according to a rational system of classification. The plan of work is outlined in a syllabus, arranged according to Holland's *Elements of Jurisprudence*, and giving explicit references to the leading authorities. *4 hrs. second half.*

Professor JONES.

## HISTORY AND POLITICAL SCIENCE.

BERNARD MOSES, PH.D. (Heidelberg),  
*Professor of History and Political Economy.*

THOMAS R. BACON, A.B. (Yale),  
*Associate Professor of European History.*

CARL C. PLEHN, A.B. (Brown), PH.D. (Göttingen),  
*Assistant Professor of History and Political Science.*

F. F. HAYNES, PH.D. (Harvard),  
*Instructor in United States History.*

CLARENCE W. LEACH, PH.B.,  
*Instructor in History.*

### Primarily for Graduates.

17. Political Science.

A course of study in the Science of Politics, including the history of political thought since the middle of the eighteenth century. *2 hrs. second half.*

Professor MOSES.

18. Theories of Social Progress.

A critical examination of the theories hitherto offered to explain the forces, methods, and aims of social progress. *2 hrs. first half.* Professor MOSES.

20. The History of the Christian Church.

This course includes the history of the spread of Christianity, and of the doctrines and polity of the church. *2 hrs. first half.* Associate Professor BACON.

**For Graduates and Advanced Undergraduates.**

9. Spanish American History and Institutions.

Administration during the colonial period ; the War of Independence ; the political development of the Spanish-American republics. *2 hrs. second half.* Professor MOSES.

13. Local Government and Administration.

A comparative study of the local institutions of the principal nations. *4 hrs. first half.* Assistant Professor PLEHN.

14. Finance and Taxation.

The principles and methods of taxation ; comparative study of the chief modern systems ; public debts and banking. *4 hrs. second half.* Assistant Professor PLEHN.

15. Economic Theory.

Critical study of writers and systems ; discussion of unsettled problems in political economy ; socialism. *4 hrs. second half.* Professor MOSES.

16. History of Political Theories.

The history of political thought to the middle of the eighteenth century, and its practical influence on institutions. *4 hrs. first half.* Professor MOSES.

**SEMITIC LANGUAGES AND LITERATURE.**

JACOB VOORSANGER, Rabbi (Amsterdam),  
*Professor of the Semitic Languages and Literature.*

In this department, recently established, it is the intention of the University to offer elementary and advanced instruction in Hebrew, Aramaic, Assyrian, Arabic, and the cognate languages, suitable for special students of Semitic philology, as well as for those who intend to pursue theological studies.

**Primarily for Graduates.**

1. The Elements of Syriac. *1 hr. throughout the year.*  
Professor VOORSANGER.
2. Advanced Hebrew. *2 hrs. throughout the year.*  
Professor VOORSANGER.

**For Graduates and Advanced Undergraduates.**

3. The Elements of Hebrew. *3 hrs. throughout the year.*  
Professor VOORSANGER.

CLASSICAL PHILOLOGY.

[Including the work of the Department of Greek and the Department of Latin.]

- EDWARD BULL CLAPP, PH.D. (Yale),  
*Professor of the Greek Language and Literature.*
- WILLIAM AUGUSTUS MERRILL, PH.D. (Ohio), L.H.D. (Miami),  
*Professor of the Latin Language and Literature.*
- ISAAC FLAGG, A.B. (Harvard), PH.D. (Göttingen),  
*Associate Professor of Classical Philology.*
- GEORGE MOREY RICHARDSON, A.B. (Harvard), PH.D. (Leipzig),  
*Associate Professor of Classical Archæology.*
- LEON JOSIAH RICHARDSON, A.B. (Michigan),  
*Instructor in Latin.*
- WALTER HUDDLESTON GRAVES, A.B.,  
*Reader in Greek and Latin.*

COURSES IN GREEK.

**Primarily for Graduates.**

One or more of these courses will be given each year, according to the needs of students.

1. The Republic of Plato.  
*4 hrs. throughout the year.*  
Professor CLAPP.
2. Aeschylus, the Plays and Fragments.  
Professor CLAPP.
3. Sophocles, the Plays and Fragments.  
Associate Professor FLAGG.
4. Greek Seminary:  
Based on Book XXII. of the Iliad.  
Professor CLAPP.



**For Graduates and Advanced Undergraduates.**

Courses marked I. will be given in 1895-96; those marked II. in 1896-97.

10. I. The Attic Orators.  
Associate Professor FLAGG.
11. I. Sophocles, the Oedipus Tyrannus and Oedipus at Colonus.  
Professor CLAPP.
12. I. Demosthenes and Aeschines.  
Professor CLAPP.
13. I. Aeschylus, the Persians and Seven against Thebes.  
Associate Professor FLAGG.
14. II. Thucydides.  
Associate Professor FLAGG.
15. II. Euripides, Selected Plays.  
Professor CLAPP.
16. II. The Gorgias of Plato.  
Professor CLAPP.
17. II. Pindar, the Olympian and Pythian Odes.  
Associate Professor FLAGG.
19. II. Greek and Roman Bucolic Poetry.  
Associate Professor RICHARDSON.

COURSES IN LATIN.

**Primarily for Graduates.**

Courses marked I. will be given in 1895-96; those marked II. in 1896-97; those marked III. in 1897-98.

30. I. III. Latin Verse Composition.  
Mr. RICHARDSON.
31. I. Roman Satire.  
Associate Professor RICHARDSON.
32. II. Greek and Roman Bucolic Poetry.  
Associate Professor RICHARDSON.
34. I. II. Latin Seminary, based on Lucretius.  
Professor MERRILL.
39. II. Ancient Italic Dialects. Elements of Oscan and Umbrian.  
Professor MERRILL.

**For Graduates and Advanced Undergraduates.**

13. I. II. Latin Composition.

Extended Idiom; translation of English masterpieces.  
*1 hr. throughout the year.*

Associate Professor RICHARDSON.

CLASSICAL PHILOLOGY—(CONTINUED).

15. I. Tibullus and Propertius.  
Roman Elegiac Poetry. *3 hrs. first half.*  
Associate Professor RICHARDSON.
16. II. Ovid, Fasti.  
Roman Mythology. *3 hrs. first half.*  
Associate Professor RICHARDSON.
18. I Tacitus, Histories. Suetonius. *2 hrs. first half.*  
Professor MERRILL.
19. I. Patristic Latin.  
Tertullian, Jerome, Augustine, and the Hymn Writers.  
*3 hrs. first half.* Professor MERRILL.
20. II. Martial. Juvenal.  
Society under the Cæsars. *3 hrs. first half.*  
Professor MERRILL.
21. II. Juristic Latin.  
Latinity of Gaius and Justinian. *3 hrs. second half.*  
Professor MERRILL.
24. I. Early Latin.  
Inscriptions and Fragments of Earliest Literature.  
*3 hrs. second half.* Professor MERRILL.

LECTURE COURSES IN CLASSICAL PHILOLOGY AND ARCHÆOLOGY  
SUITABLE FOR GRADUATE STUDENTS.

1. Introductory Course. *1 hr. second half.*

Lectures by the Several Instructors.

These lectures will discuss the scope and educational significance of Classical Philology, and present an outline of the history of the subject, and a description of its several departments, with some consideration of aims and methods of study at the present time.

4. Classical Archæology, I.

The private life of the Ancient Greeks. Lectures. *2 hrs. throughout the year.* Associate Professor RICHARDSON.

5. Classical Archæology, II.

Introduction to Greek Sculpture. Lectures. *2 hrs. first half.* Associate Professor RICHARDSON.

8. Classical Archæology, V.

Topography and Monuments of Ancient Rome. Lectures. *2 hrs. second half.* Associate Professor RICHARDSON.

SANSKRIT AND COMPARATIVE PHILOLOGY.

Courses in these subjects will be announced in the circular for 1896-97.

## ENGLISH.

CHARLES MILLS GAYLEY, A.B. (Michigan),  
*Professor of the English Language and Literature.*

CORNELIUS B. BRADLEY, A.M. (Oberlin),  
*Professor of Rhetoric.*

ALEXIS F. LANGE, PH.D. (Michigan),  
*Assistant Professor of English.*

WILLIAM D. ARMES, PH.B.,  
*Instructor in English.*

LOUIS DU PONT SYLE, A.M. (Yale),  
*Instructor in English.*

THOMAS F. SANFORD, A.B. (Yale),  
*Instructor in English.*

EVANDER B. MCGILVARY, A.M. (Princeton),  
*Instructor in English.*

### Primarily for Graduates.

#### 24. Old Icelandic.

Outline of the grammar; readings. The relations of Old Icelandic to Gothic and Old English. Introduction to Germanic Philology. *2 hrs. throughout the year.*

Assistant Professor LANGE.

Open to students who have an elementary knowledge of Old English or of Gothic.

#### 25. Phonology.

First Modern English. *2 hrs. throughout the year.*

Assistant Professor LANGE.

#### 26. The Influence of Germany on the English Literature of the eighteenth and nineteenth centuries. *2 hrs. throughout the year.*

Assistant Professor LANGE.

Of courses 24, 25, 26, two will be given during 1895-96.

#### 27. The Mediæval Spirit as Related to Art.

Its chief exponents in English Literature, with special reference to its modern revivals. *2 hrs. throughout the year.*

Professor BRADLEY.

#### 28. The Essay.

A study of its development, and of certain of its perfected types in English Literature. *2 hrs. throughout the year.*

Professor BRADLEY.

#### 29. The English Novel.

An inquiry into the relations between the conditions of modern thought and the development of this form of literary art; with discussion of selected authors and types. *To be given in 1896-7.*

Professor BRADLEY.

30. Æsthetics.

The history of Æsthetic Theory : a study at first-hand of the principal authorities, and of the literary art that chiefly influenced them. Seminary ; Bosanquet's History of Æsthetic being used as a guide.

(a) Plato, Aristotle and Plotinus. (Given in 1893-94.)

(b) The Middle Ages, the Renaissance, and Modern Æsthetics. (Given in 1894-95.)

(c) The doctrines of an English critic (in 1895-96, Coleridge) : — a study of sources and literary influence.

*2 hrs. throughout the year.*

Professor GAYLEY.

31. English Comedy.

A careful investigation of one or two problems in the development of the type. *2 hrs. throughout the year.*

Professor GAYLEY.

Students who have not taken the undergraduate course in this subject (given 1893-4-5) may obtain from the instructor a syllabus of the reading prerequisite to the graduate course.

32. Literary Composition.

*2 hrs. throughout the year.*

Professor GAYLEY.

33. Special Study.

The instructors hold themselves ready to assist and advise competent graduates who may propose plans of special study which meet the approval of the department.

For Graduates and Advanced Undergraduates.

12. Advanced Old English.

A critical study of Beowulf. *2 hrs. first half.*

Assistant Professor LANGE.

23. Study of an Author.

Entire production of some selected author of limited scope, to gain a complete view. *2 hrs. second half.*

Professor BRADLEY.

9. Problems of Literary Criticism.

A comparative inquiry into the growth, technique and function of various literary species ; with application to typical English masterpieces. *3 hrs. second half.*

Professor GAYLEY.

## GERMAN.

ALBIN PUTZKER, A.M. (Knox),  
*Professor of the German Language and Literature.*

J. HENRY SENGEL, Ph.D.,  
*Assistant Professor of German.*

HENRY E. G. ONGERTH,  
*Reader in German.*

### Primarily for Graduates.

1. German Literature. *2 hrs. throughout the year.*  
Professor PUTZKER.
2. History of the German Language. *3 hrs. throughout the year.*  
Assistant Professor SENGEL.

### For Graduates and Advanced Undergraduates.

3. Old and Middle High German. *2 hrs. first half.*  
Assistant Professor SENGEL.
4. Gothic. *2 hrs. second half.*  
Assistant Professor SENGEL.
5. Goethe. *3 hrs. throughout the year.*  
Assistant Professor SENGEL.
6. Lessing. *3 hrs. throughout the year.*  
Professor PUTZKER.

Five other advanced undergraduate courses.

## ROMANCE LANGUAGES.

F. V. PAGET, Bachelier ès Lettres, Bachelier ès Sciences (University of France).  
*Professor of the French and Spanish Languages.*

CHARLES S. H. HOWARD,  
*Instructor in French.*

GUSTAVE FAUCHEUX, Bachelier ès Lettres, Bachelier ès Sciences  
*Instructor in French.* (University of France.)

### Primarily for Graduates.

1. Comparative Romance Philology. (a) Phonetics. (b) Morphology. (c) Syntax. *2 hrs. throughout the year.*  
Professor PAGET.
2. Old French.  
Reading, with literary and philological comments. *2 hrs. throughout the year.*  
Mr. FAUCHEUX.

### For Graduates and Advanced Undergraduates.

1. The Romantic School in the French Literature of the 19th century. *1 hr. throughout the year.*  
Professor PAGET.

ROMANCE LANGUAGES—(CONTINUED.)

2. The French Literature of the 18th century. *1 hr. throughout the year.*  
Professor PAGET.

3. Victor Hugo.

A study of his literary and political doctrines as seen in the following works: (a) William Shakespeare. (b) *Littérature et philosophie mêlées*. (c) *Le Dernier jour d'un Condamné*—Claude Gueux. (d) *Pendant l' Exil*. (e) *Religion et Religions—l' Ane*.  
*2 hrs. throughout the year.*  
Professor PAGET.

4. Victor Hugo's *La Légende des siècles*.

Reading and interpretation. *2 hrs. throughout the year.*  
Mr. FAUCHEUX.

ITALIAN.

5. Dante's *La Divina Commedia*. *2 hrs. each half.*

Professor PAGET.

SPANISH.

6. Lope de Vega and Calderon.

The Spanish drama of the 16-17 centuries. *Don Quijote*.  
Its relation to the novel of the 16th century. *3 hrs. each half.*  
Mr. FAUCHEUX.

MATHEMATICS.

IRVING STRINGHAM, A.B. (Harvard), PH.D. (Johns Hopkins),  
*Professor of Mathematics.*

GEORGE C. EDWARDS, PH.B.,  
*Associate Professor of Mathematics.*

MELLEN W. HASKELL, A.M. (Harvard), PH.D. (Göttingen),  
*Associate Professor of Mathematics.*

ARCHIE B. PIERCE, A.M. (Harvard),  
*Instructor in Mathematics.*

LOUIS T. HENGSTLER, PH.D.,  
*Instructor in Mathematics.*

WILLIAM H. WRIGHT, B.S.,  
*Fellow in Mathematics.*

AUGUSTUS V. SAPH, B.S.,  
*Fellow in Mathematics.*

Primarily for Graduates.

Of the following graduate courses it is expected that at least six will be offered each year. In 1895-6 these will be Courses 21, 22, 23, 31, 32, 33 and 34.

21. Theories of Functions of Real Variables.

Simple and multiple integrals; line, surface and space integrals; Laplace's Equation and its applications; series; geometrical applications. *2 hrs. each half. Year course.*

Professor STRINGHAM.

22. Theory of Functions of a Complex Variable.

Lectures on the general theory of functions, with especial reference to the ideas of Riemann. *2 or 3 hrs. each half. Year course.*

Associate Professor HASKELL.

23. Elliptic Functions.

Reduction of elliptic integrals, Abel's Theorem and its application to the geometry of plane curves, development of elliptic functions in series, application to various problems of geometry and mechanics. *2 or 3 hrs. each half. Year course.*

Professor STRINGHAM.

25. Theory of Algebraic Forms.

Theory of linear transformation, invariants and covariants of binary and ternary quantities. *4 hrs. first half.*

Associate Professor HASKELL.

26. Higher Plane Curves.

Application of the theory of forms to the higher plane curves; in particular, to curves of the third and fourth order, and of the third and fourth class. *4 hrs. second half.*

Associate Professor HASKELL.

27. Analytic Geometry of Space.

The analytic geometry of the straight line in space, the plane and the conicoids; introduction to the general theory of higher curves and surfaces; a short discussion of quaternary forms. *4 hrs. one half.*

Associate Professor HASKELL.

28. Absolute Geometry.

The axioms of geometry, the generalized notions of space, the geometry of the non-euclidean plane and of special forms of hyper-space. *2 hrs. each half. Year course.*

Professor STRINGHAM.

30. Theory of Numbers.

Properties of whole numbers, both ordinary and complex, theory of congruences, residues of powers, primitive roots, quadratic forms. *4 hrs. first half.*

Associate Professor HASKELL.

31. Theory of Substitutions.

General properties of substitutions, theory of groups, algebraic resolution of equations, cyclotomic and Abelian equations, Klein's theory of the icosahedron and of equations of the fifth degree. *2 hrs. each half. Year course.*

Associate Professor HASKELL.

32. Partial Differential Equations.

Theory of definite integrals, Fourier's Theorem and applications, Lamé's and Bessel's Functions. *3 hrs. first half.*

Professor STRINGHAM.

33. Spherical Harmonics.

Elements of the theory of spherical harmonics, with special reference to their application in the solution of certain physical problems. *3 hrs. second half.*

Professor STRINGHAM.

34. Mathematical Seminary.

Conferences between members of the mathematical department and students engaged in higher mathematical work, for the discussion of questions related to their studies, and for the examination of recent mathematical literature; under the direction of Professor STRINGHAM. *Monday afternoons.*

**For Graduates and Advanced Undergraduates.**

15. Analytical Projective Geometry.

The fundamental principles of projective geometry treated analytically. The principle of duality, cross-ratios, involution, linear transformations of one-, two- and three-dimensional figures, particularly of loci of the second order and class. *3 hrs. each half. Year course.*

Mr. PIERCE.

16. Quaternions.

An elementary presentation of the principles of the subject, with illustrations of its applications to geometry and mechanics. *3 hrs. each half. Year course.*

Mr. PIERCE.

17. History of Mathematics.

Outline of the history of mathematical discovery, and of the development of mathematical thought with special reference to its significance as a factor in human progress. *2 hrs. each half. Year course.*

Dr. HENGSTLER.

18. Logic of Mathematics.

Analysis of the foundation principles of geometry and algebra. The number-system and the vector-system of algebra compared. The geometrical theory of proportion, and the irrational. Historical notes. *2 hrs. second half.*

Professor STRINGHAM.

19. Differential Equations.

Theory and methods of solution of total differential equations, followed by a short introduction to partial differential equations *3 hrs. each half. Year course.*

Associate Professor EDWARDS.



## PHYSICS.

FREDERICK SLATE, B.S. (Brooklyn Polytechnic),  
*Professor of Physics.*

\*HAROLD WHITING, PH.D. (Harvard),  
*Associate Professor of Physics.*

WILLIAM J. RAYMOND, B.S.,  
*Instructor in Physics.*

ELMER R. DREW, B.S.,  
*Instructor in Physics.*

———, ———, ———,  
*Assistant in Physics.*

W. R. STAMPER,  
*Mechanician to the Department.*

### Primarily for Graduates.

1. Special Research in the Laboratory.
  - (a) Color.  
Associate Professor WHITING.
  - (b) Light.  
Mr. RAYMOND.
2. Dynamics of Rotation.  
Professor SLATE.
3. Readings and Discussions.
  - (a) Recent advances in the Theory of Electrolysis.
  - (b) Stresses and Strains in Elastic Solids.
  - (c) Historical Development of Physical Theories.

### For Graduates and Advanced Undergraduates.

4. Absolute Electrical Measurements.  
Mr. RAYMOND.
  5. Harmonic Motion.  
Mr. RAYMOND.
  6. Lectures and Laboratory Exercises in Sound.  
Associate Professor WHITING.
- Seven other advanced undergraduate courses.

\*Resigned. The courses here announced as offered by Associate Professor Whiting are those for 1894-5. Enquiries concerning courses for 1895-6 may be addressed to Professor Slate.

## ASTRONOMY.

### LICK OBSERVATORY.

EDWARD S. HOLDEN, A.M. (Washington University), LL.D. (Columbia),  
*Director and Astronomer.*

JOHN M. SCHAEFERLE, C.E. (Michigan),  
*Astronomer.*

EDWARD F. BARNARD, A.M. (University of the Pacific), Sc.D. (Vanderbilt),  
*Astronomer.*

WILLIAM W. CAMPBELL, B.S. (Michigan),  
*Astronomer.*

R. H. TUCKER, JR., C.E. (Lehigh University),  
*Astronomer.*

ALLEN L. COLTON, A.B., Ph.B. (Michigan),  
*Assistant Astronomer.*

The Lick Astronomical Observatory on Mount Hamilton forms a separate department of the University. The unrivalled facilities for advanced astronomical work which are afforded by the great telescope, in this favorable location, are too well known to require description here. The Department is open to graduate students under regulations prescribed by the Regents (see the REGISTER for 1892-3, p. 113). The degrees of Master of Science and Doctor of Philosophy are offered to students who have fulfilled the required conditions. A few special students, of mature age and with the proper preparation, are received during the summer. For information relating to graduate work at the Observatory intending students should address the Recorder of the University at Berkeley, or the Director of the Lick Observatory, Mount Hamilton P.O., Santa Clara County.

### STUDENTS' OBSERVATORY AT BERKELEY.

FRANK SOULÉ (Graduate U. S. Military Academy),  
*Professor of Civil Engineering and Astronomy.*

ARMIN O. LEUSCHNER, A.B. (Michigan),  
*Assistant Professor of Astronomy and Geodesy.*

### For Graduates and Advanced Undergraduates.

1. Advanced Practical Astronomy. *One evening throughout the year.* Assistant Professor LEUSCHNER.
2. History of Astronomy. *3 hrs. first half.* Assistant Professor LEUSCHNER.
3. Method of Least Squares. *2 hrs. first half.* Assistant Professor LEUSCHNER.
- \*4. Mechanical Quadratures. *3 hrs. second half.* Assistant Professor LEUSCHNER.
- \*5. Interpolation. Construction and Use of Tables. Empirical Formulæ. *3 hrs. second half.* Assistant Professor LEUSCHNER.
6. Theoretical Astronomy. *4 hrs. throughout the year.* Assistant Professor LEUSCHNER.

\* Courses 4 and 5 are given in alternate years. In 1895-6 Course 5 will be given.

## CHEMISTRY.

WILLARD B. RISING, A.M., M.E. (Hamilton), Ph.D. (Heidelberg),  
*Professor of Chemistry.*

EDMOND O'NEILL, Ph.B.,  
*Assistant Professor of Organic and Physiological Chemistry.*

WILLIAM J. SHARWOOD, A.R.S.M. (London),  
*Instructor in Chemistry.*

WALTER C. BLASDALE, B.S.,  
*Assistant in Chemistry.*

ROBERT S. NORRIS, B.S.,  
*Assistant in Chemistry.*

VICTOR LENHER, B.S.,  
*Assistant in Chemistry.*

### Primarily for Graduates.

General Courses. Topics for critical study, involving the consultation of original authorities, will be assigned to students, and they will be expected to present the results of their work at the regular meeting of the Seminary. The following lines of study are now open to students:

- (1.) Theoretical Chemistry with Laboratory Practice.
- (2.) Thermal Chemistry with Laboratory Practice.
- (3.) Inorganic Chemistry, a reading of some of the older classical investigations and a critical review of some of the same from the standpoint of the modern chemical theories.
- (4.) Selected Topics from the Inorganic Chemistry, with laboratory practice (including the synthetical preparation of important classes of compounds.)
- (5.) Selected Topics from Chemical Technology, with laboratory practice.
- (6.) Study of Methods of Quantitative Analysis (Advanced Course.) This course will include the study of methods of determination and separation with a view to demonstration of the principles involved.

Special Course. Research Work. Students will be assigned a subject which they will be expected to investigate in the laboratory receiving regular assistance in their work.

The laboratories are new, commodious and well adapted to the carrying out of research work. A good supply of modern apparatus will be at the disposal of competent students.

The libraries of the University contain a full set of the important chemical journals.

## BOTANY.

\*EDWARD L. GREENE, PH.B. (Albion),  
*Professor of Botany.*

MARSHALL A. HOWE, PH.B. (Vermont),  
*Instructor in Cryptogamic Botany.*

WILLIS L. JEPSON, PH.B.,  
*Assistant in Botany.*

### Primarily for Graduates.

1. Systematic Critical Studies in Cryptogamous Plants, (for which California offers a unique field.)

Mr. HOWE.

2. Histological and Embryological Studies in the Higher Cryptogamia.

Mr. HOWE.

3. Critical Work upon the Phanerogamic Flora of some special district, embracing researches in field, herbarium and library.

Professor GREENE.

4. History of Botany, with special research in the instructor's extensive library of early botanical works.

Professor GREENE.

### For Graduates and Advanced Undergraduates.

5. The Phanerogamic Natural Orders.

Professor GREENE.

6. Vegetable Histology.

Mr. HOWE.

7. Medical Botany.

Professor GREENE.

8. Advanced Systematic Botany.

Professor GREENE.

9. Economic Botany.

Professor GREENE.

\*Resigned. The courses here announced as offered by Professor Greene are those for 1894-5. Enquiries concerning courses for 1895-6 may be addressed to Mr. Howe.

## GEOLOGY AND MINERALOGY.

JOSEPH LECONTE, A.M. (Georgia), M.D. (New York), B.S. (Harvard), I.L.D.  
*Professor of Geology and Natural History.* [(Georgia).

ANDREW C. LAWSON, M.A. (Toronto), Ph.D. (Johns Hopkins),  
*Associate Professor of Geology and Mineralogy.*

JOHN C. MERRIAM, Ph.D. (Munich),  
*Instructor in Palaeontology.*

WILLIAM SIDNEY T. SMITH, A.B.,  
*Fellow in Mineralogy.*

For purposes of training in research there is probably nowhere a more inviting geological field than that which lies immediately at the gates of the University of California. In nearly all departments of geology the problems offered to the student are varied and interesting. In the treeless region between Berkeley and Mount Diablo, and on the San Francisco and Marin peninsulas, there are magnificent illustrations of mountain structure, and the opportunities for acquiring skill in stratigraphy and in the interpretation of structural phenomena could scarcely be surpassed. The strata of the region are replete with Cretaceous and Tertiary fossils. The igneous rocks range in character from the most acid to the most basic, and include plutonic intrusives, dykes and volcanic flows. In themselves and in the metamorphic contact zones, which they have developed in the adjoining country rock, they afford to the student of petrography abundant material for study. In dynamic geology the operation of wave, wind and stream in the evolution of geomorphic form, is finely illustrated, as are, also, the phenomena due to vertical oscillations of the coast. The facilities for local field work are ample. The region adjacent to the Bay of San Francisco, from latitude  $37^{\circ} 30'$  northward, is being mapped topographically by the United States Geological Survey, and excellent contour maps are becoming available as the work proceeds. These maps are made the basis for instruction in geological cartography.

In the wider field of the entire State, many broad and philosophic problems in geological science grow upon the student as he becomes familiar with the structure and physiography of the country. Movements of vast extent have occurred on the western margin of the continent in the most recent times, and the conditions for their study are most favorable. Such questions as are involved in the doctrine of isostasy and in the theories of orogeny and epeirogeny are constantly suggested to the student by his environment. The new science of geomorphology could scarcely find a more promising field for the concrete illustration of its principles. In the Sierra Nevada studies in glaciology may be pursued to very great advantage. In petrology and mineralogy a large and inviting field awaits the investigator. The economic geology of the State has as yet been little studied.

In palaeontology and historical geology, California offers unlimited material to the student desirous of engaging in research. Almost the

entire geological column from the Cambrian to the Quaternary is represented by fossiliferous horizons; and although valuable contributions to the palæontology of the State have been made by Conrad Gabb and others, many of the more important problems relating to the geological position and faunal relations of the California formations are still unsolved.

The *laboratories* and *museums* of the department are well equipped for research and new material and apparatus are being added yearly. A collection of minerals comprising nearly 20,000 specimens is at the disposal of the student. The petrographical collections contain representatives of nearly all the rock types.

The collection of fossils in the departmental museum represents fully the development of invertebrate life, and as a working collection is excelled by few in America. The material collected by the State Geological Survey, including the majority of Gabb's types, is in the collection, furnishing an almost complete set of species for comparison.

The activity in research during the past few years has led to the establishment of the *BULLETIN OF THE DEPARTMENT OF GEOLOGY*, of which nine numbers have been issued.

During the year 1895-6, Professor LECONTE will lecture twice a week on the following special topics: Mountain Structure, Organic Evolution in Geology, Quaternary Geology, The Glacial Epoch in California, Genesis of Metalliferous Veins.

Associate Professor LAWSON will conduct graduate work in inorganic geology, including discussions of special topics and advanced problems, critical reviews of current literature, prosecution of geological research with the view to publication of results, methods of geological surveying and cartography, and petrographical studies.

Dr. MERRIAM will conduct advanced instruction and research in palæontology.

## CIVIL ENGINEERING.

FRANK SOULÉ (Graduate U. S. Military Academy),  
*Professor of Civil Engineering and Astronomy.*

H. I. RANDALL, B.S.,  
*Instructor in Civil Engineering.*

For advanced work in Civil Engineering the Laboratory has recently been furnished with a large selection of apparatus specially provided to make tests and original experiments upon the materials used in engineering construction.

Every facility will be offered to engineering students desiring to do advanced work to make use of this apparatus in prosecuting, under the direction of the department, any duly approved original and independent investigations.

## MECHANICAL ENGINEERING.

FREDERICK GODFRAY HESSE (Graduate of Gewerbe Institut, Treves),  
*Professor of Mechanical Engineering.*

FREDERICK SLATE, B.S. (Brooklyn Polytechnic),  
*Professor of Physics.*

CLARENCE L. CORY, M.M.E. (Cornell),  
*Assistant Professor of Mechanical Engineering.*

J. N. LECONTE, M.M.E. (Cornell),  
*Instructor in Mechanical Engineering.*

LEVI F. CHESEBROUGH,  
*Instructor in Mechanic Arts.*

Graduate students who wish to engage in advanced work in Hydraulics, Thermodynamics, Experimental Engineering, Electrical Engineering, or related subjects, will be admitted to any of the Advanced Undergraduate Courses named below, on giving evidence that they possess the fundamental knowledge which will enable them to do justice to the instruction offered. They will also be given all possible assistance, outside the lecture room, in the pursuit of advanced study and original investigation. A new and well equipped building is devoted to the work of this department.

1. Hydraulics and Hydraulic Machinery. *3 hrs. second half.*  
Professor HESSE.
2. Thermodynamics. *3 hrs. first half.*  
Professor HESSE.
3. Dynamics of Heat Engines. *3 hrs. second half.*  
Professor HESSE.
4. Experimental Engineering; Mechanical Laboratory. *6 hrs. throughout the year.*  
Professor HESSE and Assistant Professor CORY.
5. Electrical Engineering.
  - (a) Alternating Currents and Alternating Current Machinery. *4 hrs. first half.*  
Assistant Professor CORY.
  - (b) Electricity in Engineering and Principles of Electrical Installation. *4 hrs. second half.*  
Assistant Professor CORY.
  - (c) Electrical Laboratory and Designing. *6 hrs. throughout the year.*
6. Special Reading and Research.  
Professor HESSE and Assistant Professor CORY.

Courses offered in Mathematics and Physics by Professors STRINGHAM, HASKELL, and SLATE, may be advantageously taken in connection with Course 6.



## MINING AND METALLURGY.

SAMUEL B. CHRISTY, PH.D.,

*Professor of Mining and Metallurgy.*

ERNEST A. HERSAM, B.S. (Massachusetts Institute of Technology),

*Instructor in Metallurgy and Analytical Assistant.*

ERNEST H. SIMONDS, B.S.,

*Instructor in Assaying and Mill Assistant.*

FRANK RICHARDS,

*Laboratory Helper.*

### Primarily for Graduates.

#### 1. Ore Dressing.

Theory of ore-separation. Discussion of the methods in use for separating coarsely and finely disseminated minerals, with particular reference to the treatment of gold and silver ores. *2 hrs. throughout the year.*

#### 2. Research Work in Ore Dressing and the Metallurgy of Gold and Silver. *Hours to be arranged with the head of the Department.*

### For Graduates and Advanced Undergraduates.

The following courses, given as undergraduate courses at the University of California, are open to graduate students whose previous work in Science and Engineering has fitted them to undertake them:

Mining, four courses.

Metallurgy, six courses.

Assaying, two courses.

These courses require twenty-three hours work per week for each term and include both lecture and laboratory work.

The attention of those who are desirous of fitting themselves for the mining and metallurgy of the precious metals is directed to these courses, as the libraries, laboratories and museums of the University have been carefully designed to meet the needs of such students, and it is confidently believed that opportunities are offered in these lines which are not to be met with elsewhere.

## MECHANICAL DRAWING.

HERMAN KOWER, C.E. (Stuttgart),

*Assistant Professor of Instrumental Drawing.*

### For Graduates and Advanced Undergraduates.

#### 1. Graphostatics.

Graphical analysis of stresses in engineering structures. *2 hrs. first half.* Assistant Professor KOWER.

#### 2. Construction.

Design of roof trusses, highway and railroad bridges, dams, etc. *9 hrs. throughout the year.* Assistant Professor KOWER.



## AGRICULTURE, HORTICULTURE, AND ENTOMOLOGY.

EUGENE W. HILGARD, Ph.D. (Heidelberg), LL.D. (Columbia).

*Professor of Agriculture, and Agricultural Chemistry.*

EDWARD J. WICKSON, A.M. (Hamilton),

*Associate Professor of Agriculture, Horticulture, and Entomology.*

ROBERT H. LOUGHRIDGE, Ph.D. (Mississippi),

*Assistant Professor of Agricultural Geology and Chemistry.*

CHARLES W. WOODWORTH, M.S. (Illinois),

*Assistant Professor of Entomology.*

MYER E. JAFFA, Ph.B.,

*Instructor in the Agricultural Laboratory.*

GEORGE E. COLBY, Ph.B.,

*Instructor in the Viticultural Laboratory.*

ARTHUR P. HAYNE, Ph.B.,

*Graduate Assistant in Viticulture.*

### Primarily for Graduates.

1. Advanced course in the study of Soil Chemistry and Soil Physics, and their relations to natural vegetation and culture.  
Professor HILGARD.
2. Advanced course in the study of Soil Areas and Soil Distribution in California; their derivation and cultural value.  
Professor HILGARD and Assistant Professor LOUGHRIDGE.
3. Advanced instruction in Horticulture with stated residence and observation at the University Experiment Station, including experiments in cross pollination, studies of comparative economic values of cultivated plants, their adaption to local climatic conditions, etc.  
Associate Professor WICKSON.

### AGRICULTURAL LABORATORY.

4. Extended researches in general agriculture including special and original investigations of soils, alkalies, waters, foods, fruits, wines, sugars, etc. Mr. JAFFA and Mr. COLBY.

This course is intended for graduate students, but may be undertaken by others having sufficient chemical knowledge and experience.

5. Advanced Course in Zymology, with laboratory work, original investigations in bacteriology and fermentation.

Mr. HAYNE and Mr. COLBY.

This course is designed more especially for students who, after having completed their undergraduate work, wish to pursue some special branch of Viticulture or Oenology. The course will be made to suit the special needs of students as most of it will be laboratory work.

## HIGHER DEGREES.

The higher degrees of the University are conferred under the following conditions:

A candidate for the degree of Master of Arts, Master of Letters, or Master of Science, must have obtained either the corresponding Bachelor's Degree from this University, or a degree which the proper faculty accept as an equivalent, conferred by some other university or college of acknowledged good standing. His application must be made, through the Recorder, to the Faculty of the College in which he seeks his degree, and must contain a full statement of the studies upon which he proposes to base his candidacy. Upon approval of this application, a committee will be appointed to have supervision of his work, to conduct his examination, and to pass upon the original dissertation which he is to present. The course of study must cover a period of not less than one year, which must ordinarily be passed in residence at the University. Only in the case of graduates of this University may this requirement, in rare cases, be remitted, but the course of study must then be extended to two years.

A candidate for the degree of Doctor of Philosophy must be a graduate of this University, or of some other university or college of acknowledged good standing. He must pursue a course of study selected by himself, and approved by the proper faculty, embracing one principal and two subsidiary subjects, and extending over a period of at least three years, one of which must ordinarily be spent at this University; but in cases where continuous residence is impossible, the course of study must be extended to at least four years, and the separate periods of residence must together amount to at least three academic terms. He must present to the proper faculty for approval, previous to the final examination for the degree, a dissertation bearing on the principal subject of his course, and of such a character as to show his power to do original work. Special emphasis is laid upon this requirement, and the degree will in no case be given merely for the faithful completion of a course of study however extensive. A knowledge of Latin, equal to that required for admission to the College of Letters in this University, will be insisted on in all cases.

The professional degrees of Mechanical Engineer, Mining Engineer, Metallurgical Engineer, and Civil Engineer, will be given under conditions which may be learned in detail from the heads of the appropriate departments, upon the completion of one year of successful professional work, in addition to a specified course of graduate study.

The above statements concerning the length of time which must be spent in graduate study by candidates for the higher degrees, are understood to apply to students who can give all their time to study. In the case of persons who desire to carry on graduate studies while engaged in some other occupation, a proportionately longer period will be required.

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UNIVERSITY OF CALIFORNIA.

ANNOUNCEMENT OF COURSES

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GRADUATE INSTRUCTION.

1896-97.

BERKELEY :  
PUBLISHED BY THE REGENTS OF THE UNIVERSITY.  
1896.

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Printed at the State Printing Office, Sacramento.  
A. J. JOHNSTON, Superintendent.

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# UNIVERSITY OF CALIFORNIA.

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## COURSES OF GRADUATE INSTRUCTION, 1896-97.

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Advanced instruction, leading to the degrees of Master of Arts (with the corresponding degrees in Letters and Science) and Doctor of Philosophy, is offered by the University of California to graduates of any reputable college or university. If in any case the preliminary training of such students has not been sufficient to qualify them for strictly graduate work, they will be admitted to such undergraduate courses, in the department in which they expect to study, as may be suited to their needs.

The University Library contains about 62,000 volumes, and is admirably adapted, so far as its extent allows, for purposes of advanced study and research. Other libraries, containing about 500,000 volumes in all, are easily accessible and may be used by advanced students. The laboratories are extensive and well equipped, and every facility is afforded for work in the higher lines of pure and applied science. No charge is made for instruction, or the use of the library, and the expenses of living in Berkeley are moderate.

The present circular is intended merely to call attention to the opportunities for graduate work offered by this University. Fuller information in regard to the requirements for the higher degrees, or on other points, may be obtained by addressing the heads of the different departments.

The next academic year of the University begins August 10, 1896. Graduate students should register at the Recorder's office on Thursday, August 13th.





# DEPARTMENTS AND COURSES OF INSTRUCTION.

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## PHILOSOPHY.

GEORGE H. HOWISON, A.M., LL.D. (Marietta),  
*Mills Professor of Intellectual and Moral Philosophy and Civil Polity.*

GEORGE M. STRATTON, A.B., A.M. (Yale),  
*Instructor in Philosophy.*

EVANDER BRADLEY MCGILVARY, A.M. (Princeton),  
*Instructor in Logic.*

———, A.B.,  
*Fellow in Philosophy.*

### Primarily for Graduates.

#### 1. Hegel's Logic.

A critical study of the *Wissenschaft der Logik*, with comparison of the *Lesser Logic* and the principal commentaries.

Professor HOWISON.

#### 2. The Philosophy of Plato.

Exposition and criticism, with discussion of leading modern theories of Platonism.

Professor HOWISON.

### For Graduates and Advanced Undergraduates.

#### 3. The Philosophy of Kant.

The cardinal doctrines of the system expounded and criticised.

Professor HOWISON.

#### 4. Ethics and Civil Polity.

Outline and criticism of the main ethical discussions, and of the leading political theories.

Professor HOWISON.

#### \*5. Advanced General Logic.

The developments in the science since J. S. Mill.

Mr. MCGILVARY.

#### 6. Hume and Kant.

Development and criticism of sceptical idealism, (1) in its empiristic and (2) in its rationalistic form.

Mr. MCGILVARY.

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\* Not given in 1896-97; may be expected in 1897-98.

## PEDAGOGY.

ELMER E. BROWN, PH.D. (Halle),

*Professor of the Science and Art of Teaching.*

THOMAS P. BAILEY, JR., PH.D., (South Carolina),

*Assistant Professor of the Science and Art of Teaching.*

FRANK DUNN, A.B.,

*Fellow in Pedagogy.*

### Primarily for Graduates.

1. Biological aspects of Pedagogy, with special reference to physical and mental hygiene. *2 hrs., second half.*

Assistant Professor BAILEY.

2. Graduate seminary for the study of child-life. Sessions to be held in San Francisco, at a convenient hour. *2 hrs., twice a month throughout the year.*

Professor BROWN and Assistant Professor BAILEY.

### For Graduates and Advanced Undergraduates.

3. Theory of Education. *4 hrs., first half.* Professor BROWN.

4. Seminary for the study of special problems in education. *2 hrs., throughout the year.* Professor BROWN.

Graduate students will be given special opportunities in connection with the Tompkins Observation School in Oakland.

## JURISPRUDENCE.

WILLIAM CAREY JONES, A.M.,

*Professor of Jurisprudence.*

### For Graduates.

1. Studies in Comparative Law.

A study of particular branches of the law as they appear in the modern European codes.

The subject offered in 1896-97 will be Criminal Law.

This course will embrace (1) the general principles of criminal law, with a discussion of the various theories held by philosophers and jurists, and their influence on legislation; (2) a particular study of the Criminal Code of the German Empire, with references to the codes of France, Italy, and India. *2 hrs., throughout the year.*

Professor JONES.

## For Graduates and Advanced Undergraduates.

### 2. Constitutional Law of the United States.

A critical study, along special lines, of the judicial interpretation of our constitutional law, Federal and State.

The method of study employed in this course consists, primarily, of a first-hand examination of judicial decisions. The reports of the Supreme Court of the United States constitute the chief source of investigation. Individual members of the class are directed in special lines of inquiry. It is expected that during the course of each year all the more important leading cases decided by the Supreme Court, with full references to succeeding cases, will be reported, commented on, and discussed. Other features of the course are varied from year to year.

For graduate students, who have already taken this course, more advanced work will be provided in the way of special investigation.  
*2 hrs., throughout the year.*

Professor JONES.

### 3. History of International Law.

A study of the historical development of International Law, in its literature, in treaties, and in special cases.

This course is intended to show the evolution of the relations between independent states. The history of European diplomacy will be traced. The most important of the general European treaties, from the Treaty of Westphalia in 1648 to the Treaty of Berlin in 1878, will be carefully examined. Especial attention will be given to international questions in which the United States has been concerned.

For graduate students, who have already taken this course, more advanced work will be provided, in European or American diplomacy, in the study of special treaties, or in a comparative study of the views and influence of different scientific writers on International Law. *2 hrs., first half.*

Professor JONES.

### 4. Roman Law.

A systematic and historical exposition of the principles of Roman private law.

This course is a prerequisite for courses 1 and 5, and for all graduate work in jurisprudence. The arrangement of the Roman law in this course is according to modern systems of classification. The exposition gives the text of the Institutes of Justinian, and, where any difference exists, that of the Institutes of Gaius. It presents the parts of the Digest and Code that are of use to the student of modern law. It aims to set forth the whole scheme of defining and administering justice as developed by the Romans.

## JURISPRUDENCE—(CONTINUED).

For graduate students, who have already taken this course, more advanced work will be provided, in the way of a minuter study of special titles of the Digest. *4 hrs., first half.* Professor JONES.

### 5. Principles of Jurisprudence.

Study of the province and materials of Jurisprudence regarded as the Science of Positive Law.

The object of this course is to present the leading principles of modern private law according to a rational system of classification. The plan of work is outlined in a syllabus, arranged according to Holland's *Elements of Jurisprudence*, and giving explicit references to the leading authorities. *4 hrs., second half.* Professor JONES.

## HISTORY AND POLITICAL SCIENCE.

BERNARD MOSES, PH.D. (Heidelberg),  
*Professor of History and Political Economy.*

THOMAS R. BACON, A.B. (Yale),  
*Associate Professor of European History.*

CARL C. PLEHN, A.B. (Brown), PH.D. (Göttingen),  
*Assistant Professor of History and Political Science.*

CLIVE DAY, A.B. (Yale),  
*Instructor in History.*

—, —,  
*Instructor in History.*

### Primarily for Graduates.

#### 17. Political Science.

A course of study in the Science of Politics, including the history of political thought since the middle of the eighteenth century. *2 hrs., second half.* Professor MOSES.

#### 18. Theories of Social Progress.

A critical examination of the theories hitherto offered to explain the forces, methods, and aims of social progress. *2 hrs., first half.* Professor MOSES.

#### 20. The History of the Christian Church.

This course includes the history of the spread of Christianity, and of the doctrines and polity of the church. *2 hrs., throughout the year.* Associate Professor BACON.

For Graduates and Advanced Undergraduates.

9. Spanish-American History and Institutions.

Administration during the Colonial Period ; the War of Independence ; the political development of the Spanish-American republics. *2 hrs., second half.* Professor MOSES.

13. Local Government and Administration.

A comparative study of the local institutions of the principal nations. *4 hrs., first half.* Assistant Professor PLEHN.

14. Finance and Taxation.

The principles and methods of taxation ; comparative study of the chief modern systems ; public debts and banking. *4 hrs., second half.* Assistant Professor PLEHN.

15. Economic Theory.

Critical study of writers and systems ; discussion of unsettled problems in political economy ; socialism. *4 hrs., second half.* Professor MOSES.

16. History of Political Theories.

The history of political thought to the middle of the eighteenth century, and its practical influence on institutions. *4 hrs., first half.* Professor MOSES.

22. Statistics.

The history, theory, and method of statistics, as applied to economic investigation. *2 hrs., first half.* Assistant Professor PLEHN.

SEMITIC LANGUAGES AND LITERATURE.

JACOB VOORSANGER, D.D. (Amsterdam),  
*Professor of the Semitic Languages and Literature.*

Primarily for Graduates.

- |                        |                       |
|------------------------|-----------------------|
| 1. Prophetical Hebrew. | Professor VOORSANGER. |
| 2. Biblical Aramaic.   | Professor VOORSANGER. |
| 3. Arabic.             | Professor VOORSANGER. |

For Graduates and Advanced Undergraduates.

1. Hebrew. Introductory Course.

Genesis I-VIII, Deuteronomy I-VI: including (a) Essentials of Hebrew Grammar; (b) Translation from Hebrew into English, and English into Hebrew; (c) The acquisition of a modern vocabulary; (d) The principal prose accents; (e) Semitic History and Geography. *3 hrs., throughout the year.* Professor VOORSANGER.

2. Hebrew. Advanced Course.

Exodus I-II, Deuteronomy VIII-XIII, the Book of Ruth, and selections from the historical books: including (a) Advanced Grammar and Syntax; (b) Sight translation; (c) Translation from English into Hebrew; (d) Outlines of Rabbinical literature. *2 hrs., first half.* Professor VOORSANGER.

3. Aramaic. Introductory Course.

(a) Introduction to Aramaic literature; (b) Brown's Aramaic method, with extracts from the Targumin; (c) Nestle's Syriac Grammar and Chrestomathy. *2 hrs., second half.* Professor VOORSANGER.

ORIENTAL LANGUAGES AND LITERATURE.

JOHN FRYER, LL.D.,

*Agassiz Professor of Oriental Languages and Literature.*

In 1872, the Hon. EDWARD TOMPKINS deeded to the University a tract of land in Oakland, for the establishment of a Chair of Oriental Languages and Literature, to be named in honor of Professor Louis Agassiz. The letter communicating his purpose shows that he intended his gift to be used for the education of American young men looking forward to business relations in China and Japan, for the benefit of the young men of the Orient who may seek our higher educational courses, and for the scholarly understanding of the history and thought of those interesting nations. This gift was under such limitations that it became available only within the past year. The Regents have appointed to this professorship JOHN FRYER, LL.D., a gentleman educated in England, who has spent many years in China, in the Imperial service, in translating educational works into Chinese. Professor FRYER will assume the duties of his chair at the beginning of the next collegiate year.

At first Professor FRYER will give a general course on the Language and Literature of China and Japan. He will offer special instruction to those who wish to study these tongues, and he will act as adviser and

teacher to young men coming from the Orient. He brings with him a valuable library as an indispensable aid in the proposed instruction. The details of the work will be arranged after his arrival, in the early part of June, 1896. Any inquiries concerning these details may be addressed to Professor JOHN FRYER, University of California.

## GREEK LANGUAGE AND LITERATURE.

EDWARD BULL CLAPP, PH.D. (Yale),  
*Professor of the Greek Language and Literature.*

ISAAC FLAGG, A.B. (Harvard), PH.D. (Göttingen),  
*Associate Professor of Classical Philology.*

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*Assistant in Greek and Latin.*

JAMES T. ALLEN, A.B. (Pomona),  
*Reader in Greek.*

### Primarily for Graduates.

#### 30. The Odes and Fragments of Pindar.

In this course it is expected that each student, so far as possible, shall thoroughly read and master the extant works of the poet; shall make himself familiar with their metrical structure and peculiarities, and shall gain an acquaintance, at first hand, with the chief questions, textual, literary, and historical, which are involved in the study. Special investigation of important topics will be carried on by each student, leading to the preparation of original papers. *4 hrs., August to March.*

Professor CLAPP.

#### 31. Studies in Homer.

Investigation of special topics in Homeric syntax and meter, with seminary studies based on Iliad XIX. *4 hrs., March to May.*

Professor CLAPP.

#### 32. The Plays and Fragments of Sophocles.

Associate Professor FLAGG.

#### 33. The Plays and Fragments of Aeschylus.

Professor CLAPP.



For Graduates and Advanced Undergraduates.

14. Thucydides, Book IV.

2 hrs., *first half*.

Associate Professor FLAGG.

15. The Oedipus at Colonus of Sophocles.

A lecture course, with frequent oral and written tests of proficiency. 2 hrs., *first half*.

Associate Professor FLAGG.

16. The Phaedo of Plato.

2 hrs., *second half*.

Associate Professor FLAGG.

17. Selected Idylls of Theocritus, with parallel readings from Virgil.

A lecture course, with frequent oral and written tests of proficiency. 2 hrs., *second half*.

Associate Professor FLAGG.

18. Studies in Greek Syntax and Idiom, with comparison of the Latin. Translations from Latin into Attic prose. 1 hr., *throughout the year*.

Associate Professor FLAGG.

LATIN AND CLASSICAL ARCHAEOLOGY.

WILLIAM A. MERRILL, Ph.D. (Ohio),

*Professor of the Latin Language and Literature.*

ISAAC FLAGG, A.B. (Harvard), Ph.D. (Göttingen),

*Associate Professor of Classical Philology.*

\*GEORGE M. RICHARDSON, A.B. (Harvard), Ph.D. (Leipzig),

*Associate Professor of Classical Archaeology.*

JOSEPH C. ROCKWELL, A.B.,

*Assistant Professor of Classical Archaeology, ad interim.*

CLIFTON PRICE, A.B. (Cornell),

*Instructor in Latin.*

Primarily for Graduates.

30. Latin Verse Composition.

Training in writing hexameter, elegiac, and Sapphic verse. 1 hr., *throughout the year*.

Associate Professor FLAGG.

32. Greek and Roman Bucolic Poetry.

2 hrs., *second half*.

Associate Professor FLAGG.

Lectures on Theocritus, with translation of selected idylls. Lectures on Virgil, with translation and exegesis of the Eclogues.

\*Absent on leave.



34. Latin Seminary.

Criticism and interpretation of Lucretius. Exercises in diplomatic criticism; treatment of grammatical, philosophical, and literary subjects suggested by the Latin text. *3 hrs., throughout the year.*

Professor MERRILL.

36. Ancient Italian Dialects. Elements of Oscan and Umbrian.

*2 hrs., second half.*

Professor MERRILL.

For Graduates and Advanced Undergraduates.

12. Latin Prose Composition.

Extended Idiom; translation of English masterpieces.  
*1½ hrs., throughout the year.*

Assistant Professor ROCKWELL.

14. Cicero, De Republica.

*1 hr., second half.*

MR. PRICE.

Lecture course, with translation and exegesis.

16. Ovid, Fasti.

Roman Mythology. *3 hrs., second half.*

Professor MERRILL.

20. Martial. Juvenal, at sight and for private reading.

Society under the Cæsars. *3 hrs., first half.*

Professor MERRILL.

21. Juristic Latin.

The Latinity of Gaius and Justinian as it appears in the Institutes. *2 hrs., first half.*

Professor MERRILL.

This course does not discuss the contents of the Roman Law, except so far as to make the Latin intelligible.

25. Lucretius. Cicero, De Natura Deorum. Roman Epicureanism.  
*2 hrs., throughout the year.*

Associate Professor FLAGG.

COURSES IN CLASSICAL ARCHAEOLOGY.

[These courses are intended for advanced undergraduates.]

53. The Private Life of the Ancient Romans. Lectures. *2 hrs., throughout the year.*

Assistant Professor ROCKWELL.

55. Petronius, Martial.

*Cena Trimalchionis* and selected epigrams. *2 hrs., second half.*

Assistant Professor ROCKWELL.

## ENGLISH.

CHARLES MILLS GAYLEY, A.B. (Michigan),  
*Professor of the English Language and Literature.*

CORNELIUS B. BRADLEY, A.M. (Oberlin),  
*Professor of Rhetoric.*

ALEXIS F. LANGE, PH.D. (Michigan),  
*Associate Professor of English Philology.*

WILLIAM D. ARMES, M.L.,  
*Instructor in English.*

LOUIS DU PONT SYLE, A.M. (Yale),  
*Instructor in English.*

THOMAS F. SANFORD, A.B. (Yale),  
*Instructor in English.*

WALTER MORRIS HART, A.M. (Haverford),  
*Instructor in English.*

FRANCIS DUNN, A.B.,  
*Honorary Fellow in Argumentation.*

### Primarily for Graduates.

Students whose major study is English, must take courses under more than one of the graduate instructors.

#### 25. Special Studies in English Philology.

(a) Phonology: First Modern English. *2 hrs., throughout the year.*  
Associate Professor LANGE.

26. The Influence of Germany on the English Literature of the eighteenth and nineteenth centuries. *2 hrs., throughout the year.*  
Associate Professor LANGE.

#### 27. The Mediaeval Spirit in English Literature and Art.

An historical study of it in its original embodiments and in its modern revivals in England.

(a) The Middle Age: Its life, thought, and art. Dante, Chaucer, Langland, and Mallory; early lyrics, romances, and plays. (In 1896-97.)

(b) Revivals of the mediaeval spirit in English Literature since the Reformation. (In 1897-98.)

*3 hrs., throughout the year.*

Professor BRADLEY.

#### 28. The Essay.

Its historical development, and a study of some of its perfected types in English Literature. (Given in 1895-96.) *3 hrs., throughout the year.*  
Professor BRADLEY.

30. The History of Literary Criticism:

From a study at first-hand of the principal authorities. Seminary; Bosanquet's History of Æsthetic being used as a guide.

(a) Plato, Aristotle, and Plotinus. (Given in 1893-94.)

(b) The Middle Ages the Renaissance, and Modern Æsthetics.  
(Given in 1894-95.)

(c) The æsthetic bases of English criticism (in 1895-96, Wordsworth and Coleridge): a study of sources and literary influence.

3 hrs., *throughout the year.*

Professor GAYLEY.

31. English Comedy.

A careful investigation of one or two problems in the development of the type. 3 hrs., *throughout the year.* Professor GAYLEY.

Students who have not taken the undergraduate course in this subject (given 1893-4-5) may obtain from the instructor a syllabus of the reading prerequisite to the graduate course.

32. Special Study.

The instructors hold themselves ready to assist and advise competent graduates who may propose plans of special study which meet the approval of the department.

**For Graduates and Advanced Undergraduates.**

9. Problems of Literary Criticism.

A comparative inquiry into the growth, technique, and function of various literary species; with application to typical English masterpieces. 3 hrs., *second half.*

Professor GAYLEY.

12. Advanced Old English.

A critical study of Beowulf. 2 hrs., *first half.*

Associate Professor LANGE.

23. Study of an Author.

Entire production of some selected author of limited scope, to gain a complete view. 3 hrs., *second half.*

Professor BRADLEY.

## GERMAN.

ALBIN PUTZKER, A.M. (Knox),  
*Professor of the German Language and Literature.*

J. HENRY SENGGER, PH.D.,  
*Assistant Professor of German.*

HENRY E. G. ONGERTH,  
*Reader in German.*

A. F. LANGE, PH.D. (Michigan),  
*Associate Professor of English Philology.*

RICHARD WEILER, PH.D. (Göttingen),  
*Assistant in German.*

### Primarily for Graduates.

1. Authors of the Nineteenth Century.  
*2 or 3 hrs., throughout the year.* Professor PUTZKER.

2. Critical Study of Heine's Life and Works.

1. Heine, the man; 2. Heine, poet and writer; 3. Heine's attitude toward Germany; 4. Heine's position in German literature.

This course involves, among other things, a thorough study of all of Heine's writings. Open to students who have completed all the undergraduate courses in German literature. Professor PUTZKER.

3. Historical German Grammar.

A philological course, open to students who have completed all the philological undergraduate courses in German. *3 hrs., throughout the year.* Assistant Professor SENGGER.

4. Special Courses.

Special work has been assigned in the past to competent graduate students, and every assistance will be given to graduate students in the future.

### For Graduates and Advanced Undergraduates.

5. Goethe. *3 hrs., throughout the year.*  
Assistant Professor SENGGER.

6. Lessing. *3 hrs., throughout the year.*  
Professor PUTZKER.

7. Old and Middle High German. *2 hrs., first half.*  
Assistant Professor SENGGER.

8. Gothic. *2 hrs., second half.*  
Assistant Professor SENGGER.

## ROMANCE LANGUAGES.

F. V. PAGET, Bachelier ès Lettres, Bachelier ès Sciences (University of France),  
*Professor of the French and Spanish Languages.*

CHARLES S. H. HOWARD, A.B.,  
*Instructor in French.*

GUSTAVE FAUCHEUX, Bachelier ès Lettres, Bachelier ès Sciences (Univ. of France),  
*Instructor in French.*

### Primarily for Graduates.

#### 1. Comparative Romance Philology:

(a) Phonetics; (b) Morphology; (c) Syntax. *2 hrs., throughout the year.*  
Professor PAGET.

#### 2. Old French.

Reading, with literary and philological comments. *2 hrs., throughout the year.*  
Mr. FAUCHEUX.

### For Graduates and Advanced Undergraduates.

1. The Romantic School in the French Literature of the nineteenth century. *1 hr., throughout the year.*  
Professor PAGET.

2. The French Literature of the eighteenth century. *1 hr., throughout the year.*  
Professor PAGET.

#### 3. Victor Hugo.

A study of his literary and political doctrines as seen in the following works: (a) William Shakespeare; (b) *Littérature et philosophie mêlées*; (c) *Le Dernier jour d'un Condamné*—Claude Gueux. (d) *Pendant l'Exil*; (e) *Religion et Religions*—l'Ane. *2 hrs., throughout the year.*  
Professor PAGET.

#### 4. Victor Hugo's *La Légende des siècles*.

Reading and interpretation. *2 hrs., throughout the year.*  
Mr. FAUCHEUX.

### ITALIAN.

#### 5. Dante's *La Divina Commedia*. *2 hrs., each half.*

Professor PAGET.

### SPANISH.

#### 6. Lope de Vega and Calderon.

The Spanish drama of the 16-17 centuries. *Don Quixote*. Its relation to the novel of the sixteenth century. *3 hrs., each half.*

Mr. FAUCHEUX.

## MATHEMATICS.

IRVING STRINGHAM, A.B. (Harvard), PH.D. (Johns Hopkins),  
*Professor of Mathematics.*

GEORGE C. EDWARDS, PH.B.,  
*Associate Professor of Mathematics.*

MELLEN W. HASKELL, A.M. (Harvard), PH.D. (Göttingen),  
*Associate Professor of Mathematics.*

LOUIS T. HENGSTLER, PH.D.,  
*Assistant Professor of Mathematics.*

ARCHIE B. PIERCE, A.M. (Harvard),  
*Instructor in Mathematics.*

WILLIAM H. WRIGHT, B.S.,  
*Fellow in Mathematics.*

AUGUSTUS V. SAPH, B.S.,  
*Fellow in Mathematics.*

### Primarily for Graduates.

Of the following graduate courses it is expected that at least six will be offered each year. In 1896-97 these will be courses 22, 23, 24, 26, 27, and 34.

#### \*21. Theory of Functions of Real Variables.

Simple and multiple integrals; line, surface, and space integrals; Laplace's Equation and its applications; series; geometrical applications. *2 hrs., throughout the year.* Professor STRINGHAM.

#### 22. Transformation Groups and Differential Equations.

An introduction to Lie's Theory. *2 hrs., throughout the year.*  
Professor STRINGHAM.

#### 23. Partial Differential Equations.

Theory of definite integrals, Fourier's Theorem and applications, Lamé's and Bessel's Functions. *3 hrs., first half.*  
Professor STRINGHAM.

#### 24. Theory of Functions of a Complex Variable. (Introductory course.)

Lectures on the general theory of functions, with especial reference to the ideas of Riemann. *3 hrs., second half.*  
Associate Professor HASKELL.

#### \*25. Higher Geometry.

Modern developments in the analytical geometry of two and three dimensions; application of the differential and integral calculus to algebraic curves and surfaces; geometrical introduction to the theory of invariants. *3 hrs., throughout the year.*

Associate Professor HASKELL.

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\* Not offered in 1896-97.

26. Absolute Geometry.

The axioms of geometry, the generalized notions of space, the geometry of the non-euclidean plane and of special forms of hyper-space. *2 hrs., throughout the year.* Professor STRINGHAM.

27. Elliptic Functions.

Reduction of elliptic integrals, Abel's Theorem, development of elliptic functions in series, application to various problems of geometry and mechanics. *2 hrs., throughout the year.*

Associate Professor HASKELL.

\*28. Abelian Functions.

An advanced course in the theory of functions of a complex variable, with applications to the theory of higher plane curves. *2 hrs., throughout the year.*

Associate Professor HASKELL.

\*29. Spherical Harmonics.

Elements of the theory of spherical harmonics, with special reference to their application in the solution of certain physical problems. *2 hrs., throughout the year.*

Professor STRINGHAM.

\*30. Theory of Algebraic Forms.

Theory of linear transformation, invariants, and covariants of binary and ternary quantics. *2 hrs., first half.*

Associate Professor HASKELL.

\*31. Theory of Numbers.

Properties of whole numbers, both ordinary and complex, theory of congruences, residues of powers, primitive roots, quadratic forms. *2 hrs., second half.*

Associate Professor HASKELL.

\*32. Theory of Substitutions.

General properties of substitutions, theory of groups, algebraic resolution of equations, cyclotomic and Abelian equations, Klein's theory of the icosahedron and of equations of the fifth degree. *2 hrs., throughout the year.*

Associate Professor HASKELL.

34. Mathematical Seminary.

Conferences between members of the mathematical department and students engaged in higher mathematical work, for the discussion of questions related to their studies, and for the examination of recent mathematical literature; under the direction of Professor STRINGHAM. *Once a week.*

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\* Not offered in 1896-97.

For Graduates and Advanced Undergraduates.

\*15. Analytical Projective Geometry.

The fundamental principles of projective geometry treated analytically. The principle of duality, cross-ratios, involution, linear transformations of one-, two-, and three-dimensional figures, particularly of loci of the second order and class. *3 hrs., throughout the year.*

Mr. PIERCE.

16. Quaternions.

An elementary presentation of the principles of the subject, with illustrations of its applications to geometry and mechanics. *3 hrs., throughout the year.*

Mr. PIERCE.

\*17. History of Mathematics.

Outline of the history of mathematical discovery, and of the development of mathematical thought with special reference to its significance as a factor in human progress. *2 hrs., throughout the year.*

Assistant Professor HENGSTLER.

18. Logic of Mathematics.

Analysis of the foundation principles of geometry and algebra. The number-system and the vector-system of algebra compared. The geometrical theory of proportion, and the irrational. Historical notes. *2 hrs., throughout the year.*

Professor STRINGHAM.

19. Differential Equations.

Theory and methods of solution of total differential equations, followed by a short introduction to partial differential equations. *3 hrs., throughout the year.*

Associate Professor EDWARDS.

20. Selected Topics in Higher Mathematics.

A general introduction to some important methods in modern higher mathematics. *2 hrs., throughout the year.*

Professor STRINGHAM and Associate Professor HASKELL.

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\* Not offered in 1896-97.



## PHYSICS.

FREDERICK SLATE, B.S. (Brooklyn Polytechnic).  
*Professor of Physics.*

WILLIAM J. RAYMOND, B.S.,  
*Instructor in Physics.*

ELMER R. DREW, B.S.,  
*Instructor in Physics.*

E. P. LEWIS, PH.D. (Johns Hopkins),  
*Instructor in Physics.*

A. C. ALEXANDER, PH.D. (Yale).  
*Assistant in Physics.*

ARTHUR INCELL, B.S.,  
*Assistant in Physics.*

W. R. STAMPER,  
*Mechanician to the Department.*

### Primarily for Graduates.

1. Special Research in the Laboratory. Professor SLATE.
2. Dynamics of Rotation. Professor SLATE.
3. Readings and Discussions.
  - (a) Recent advances in the Theory of Electrolysis.
  - (b) Stresses and Strains in Elastic Solids.
  - (c) Historical Development of Physical Theories. Professor SLATE.

### For Graduates and Advanced Undergraduates.

4. Absolute Electrical Measurements. Mr. RAYMOND.
5. Harmonic Motion. Mr. RAYMOND.
6. Spectroscopy. Dr. LEWIS.

## ASTRONOMY.

### LICK OBSERVATORY.

- EDWARD S. HOLDEN, M.A. (Washington University), LL.D. (Wisconsin, Columbia),  
*Director and Astronomer.*
- JOHN M. SCHAEBERLE, C.E., M.S. (Michigan),  
*Astronomer.*
- W. W. CAMPBELL, B.S. (Michigan),  
*Astronomer.*
- R. H. TUCKER, JR., C.E. (Lehigh),  
*Astronomer.*
- W. J. HUSSEY, B.S. (Michigan),  
*Astronomer.*
- ALLEN L. COLTON, A.B. (Michigan),  
*Assistant Astronomer.*
- ROBERT G. AITKEN, M.A. (Williams),  
*Assistant Astronomer.*
- C. D. PERRINE,  
*Assistant Astronomer and Secretary.*

The Lick Astronomical Observatory on Mount Hamilton forms a separate department of the University. The unrivaled facilities for advanced astronomical work which are afforded by the great telescope, in this favorable location, are too well known to require description here. The Department is open to graduate students under regulations prescribed by the Regents. (See the REGISTER for 1892-93, p. 113.) The degrees of Master of Science and Doctor of Philosophy are offered to students who have fulfilled the required conditions. A few special students, of mature age and with the proper preparation, are received during the summer. For information relating to graduate work at the Observatory, intending students should address the Recorder of the University at Berkeley, or the Director of the Lick Observatory, Mount Hamilton P. O., Santa Clara County.

### STUDENTS' OBSERVATORY AT BERKELEY.

- FRANK SOULE (Graduate U. S. Military Academy),  
*Professor of Civil Engineering and Astronomy.*
- \*ARMIN O. LEUSCHNER, A.B. (Michigan),  
*Assistant Professor of Astronomy and Geodesy.*
- FREDERICK H. SEARES, B.S.,  
*Instructor in Astronomy.*
- FRANK E. ROSS, B.S.,  
*Assistant in Astronomy.*

### Primarily for Graduates.

The topics each year depend upon the needs and the preparation of the students enrolled.

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\*Absent on leave, 1896-97.

12. Graduate Course in Theoretical Astronomy. (Continuation of Course 6.) *2 hrs., throughout the year.*

In 1895-96, the course consisted in:

(1) A study of Gibbs' Vector method for the determination of orbits from three observations, and of E. Weiss' Bestimmung der Bahn eines Himmelskörpers aus drei Beobachtungen.

(2) Comparative study (as to accuracy and rapidity) of the various known methods for computing orbits.

(3) Definitive orbits (after von Oppolzer).

Assistant Professor LEUSCHNER.

### For Graduates and Advanced Undergraduates.

The topics each year depend upon the needs and the preparation of the students enrolled.

5. History of Astronomy. *3 hrs., first half.*

Assistant Professor LEUSCHNER.

6. Theoretical Astronomy. Preliminary Orbits, etc.—mainly after von Oppolzer. *4 hrs., throughout the year.*

In 1895-96, the classes in course 12 and course 6 computed and published orbits and ephemerides for the following comets: *a* 1895 (Swift), *c* 1895 (Perrine), *d* 1895 (Brooks), *a* 1896 (Perrine), *b* 1896 (Swift).

Assistant Professor LEUSCHNER.

7. Method of Least Squares. *2 hrs., first half.*

Assistant Professor LEUSCHNER.

\*8. Mechanical Quadratures. *3 hrs., second half.*

Assistant Professor LEUSCHNER.

\*9. Interpolation. Construction and Use of Tables. Empirical Formulae. *3 hrs., second half.*

Assistant Professor LEUSCHNER.

11. Advanced Practical Astronomy. *One evening a week, or one lecture a week, throughout the year.*

In 1895-96, the work consisted in a final reduction of the longitude observations (by the telegraphic method) between Mount Hamilton, Berkeley, and San Francisco, made during the preceding summer (first term), and a study of the theory of refraction (second term).

Assistant Professor LEUSCHNER.

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\* Courses 8 and 9 are given in alternate years.

## CHEMISTRY.

W. B. RISING, PH.D. (Heidelberg),  
*Professor of Chemistry.*

EDMOND O'NEILI, PH.B.,  
*Associate Professor of Organic and Physiological Chemistry.*

W. J. SHARWOOD, A.R.S.M. (London),  
*Instructor in Chemistry.*

W. C. BLASDALE, B.S.,  
*Instructor in Chemistry.*

J. HATFIELD GRAY, JR., B.S.,  
*Assistant in Chemistry.*

— — — — —,  
*Assistant in Chemistry.*

The opportunities which the Chemical Department offers for graduate study may be stated as follows: (a) *Work in the Chemical Seminary*, including readings from the original literature, with criticism, suggestions, and examinations, verifications of important statements, etc.; (b) *Investigations in the Chemical Laboratory*.

The Chemical Seminary is open to graduate students and to advanced undergraduates, who have made exceptional attainments. The meetings of the Seminary will be weekly, at which members will be required to present the results of their study and investigation. These will be subject to criticism and searching inquiry.

The subjects open to students during the coming year are as follows:

### 1. Thermal Chemistry.

General and critical study of results already obtained. This course will consist in a reading of original memoirs upon certain selected topics. It is expected that a complete and critical compilation of the data of Thermal Chemistry can be undertaken, and important points settled by independent and original experiment if necessary. This course extends throughout the whole year.

### 2. Special Course in Determination of the Heat Value of Fuels by Berthelot's Bomb.

An investigation of the heat value of fuels, including coals, crude petroleums, etc., produced or used on this coast, will be commenced and carried out during the year. Sufficiently advanced students may take part in it.

Professor RISING and Assistants.

### 3. Explosives.

A study of the theory of explosives, especially in their thermal relations. An opportunity will be given in the laboratory to determine the heat of decomposition of the explosives in Berthelot's Bomb, and also the amount and composition of the gases, etc.

Professor RISING and Assistants.

4. Selected Topics from the Inorganic Chemistry.

Readings and critical study of the original literature. This will include the so-called classical investigations of such authors as Berzelius, Bunsen, Woehler, Kopp, Stas, Berthelot, etc., etc. These memoirs will be studied in connection with more recent discoveries and theories.

Professor RISING.

5. Selected Topics from the Organic Chemistry.

Reading and discussion of original memoirs.

Professor O'NEILL.

6. Quantitative Analysis—Advanced Course.

This course will include the study of the methods of separation and determination of substances, with a view to the demonstration of the principles involved.

Professor RISING and Assistants.

The above courses are so arranged that the assignment of work is individual and can be adapted to the special wants of the student. The progress of the student will be determined solely by his industry and ability to grasp the subject. As before stated, the students and instructors of the department will meet in the Seminary and listen to the presentation and discussion of the results of study by the members. Special research work will be assigned to students, which they will be expected to carry out under the guidance of the Professor. This is regarded as the most important work of the student, and all possible help and encouragement will be given in carrying out the same.

The laboratories are new and commodious, and adapted to the work of research. The supply of modern apparatus is ample, and will be placed at the disposal of competent students.

The Library of the University, supplemented by the private libraries of the Professors, will give the student access to practically the whole literature of the subject.

BOTANY.

WILLIAM A. SETCHELL, A.B. (Yale), PH.D. (Harvard),  
*Professor of Botany.*

WILLIS L. JEPSON, PH.B.,  
*Instructor in Botany.*

———,  
*Instructor in Botany.*

Primarily for Graduates.

I. Advanced Cryptogamic Botany.

The algae of the Pacific Coast offer a fertile field for original investigation, and many simpler problems may be presented to graduate

students, who can give considerable time to the work. This course is intended to be primarily a thesis course. Professor SETCHELL.

2. Advanced Phaenogamic Botany.

Fully qualified graduate students who desire to elect studies among the Phaenogams will be assigned special problems, or the investigation of some particular group, involving work in the field and laboratory. Mr. JEPSON.

3. Advanced Histology and Cytology.

Problems in the histology or cytology of the various plants accessible in the plant-houses and gardens of the University, or to be found in the surrounding region, will be assigned to qualified students. Mr. ———.

4. Botanical Seminary.

The instructors and graduate students will meet once in two weeks to discuss botanical literature and the various problems under investigation in the laboratories and gardens.

For Graduates and Advanced Undergraduates.

5. Phycology and Mycology.

Intended for those who desire to obtain a special knowledge concerning the structure and development of the algae, fungi, and lichens. Lectures, laboratory work, reading, and excursions. *Throughout the year.*

(To be offered in alternate years. Offered in 1896-97.)

Professor SETCHELL.

6. Bryology and Pteridology.

Intended for those who desire to obtain a special knowledge of the structure and development of the hepaticae, mosses, ferns, and fern allies. Lectures, laboratory work, reading, and excursions.

(To be offered in alternate years. Omitted in 1896-97.)

Professor SETCHELL.

7. Vegetable Histology.

Intended as an introductory course to the study of the microscopic structure of the flowering plants. Simple methods of microscopic technique will be taken up and the students will make their own preparations. *First half year.*

Mr. ———.

8. Vegetable Physiology.

A course of lectures with demonstrations and reading, dealing with the various vital phenomena of plant life. *Second half year.*

Mr. ———.

9. Vegetable Cytology and Microtechnique.

A study of the cell and cell-organs, cell-division, and the cytological changes accompanying the development of the embryo, with practice in the application of staining and other reagents, imbedding in different media, use of the microtome, etc. *Throughout the year.*

Mr. ———.

10. Morphology of the Compositae.

This course, which includes studies in the general morphology of the group, followed by critical examination of various West American genera and species, is designed for those qualified students who desire to continue systematic work with the view of obtaining special knowledge of one of the more difficult orders. *First half year.*

(To be offered in alternate years. Offered in 1896-97.)

Mr. JEPSON.

11. Taxonomy and Phylogeny of Phaenogams.

Primarily a lecture course on the classification and special morphology of the natural orders of flowering plants, accompanied by detailed discussion of the probable lines of development of the larger and smaller groups. In addition, students will be assigned special topics for study, including the presentation of occasional papers or abstracts. In this course the material afforded by the Botanic Garden, the Experiment Garden, the Arboretum, and the Herbarium will be used for illustration and study.

(To be offered in alternate years. Omitted in 1896-97.)

Mr. JEPSON.

ZOÖLOGY.

JOSEPH LECONTE, A.M. (Georgia), B.S. (Harvard), M.D. (New York), I.L.D. (Georgia),  
*Professor of Geology and Natural History.*

WILLIAM F. RITTER, A.M., PH.D. (Harvard),  
*Assistant Professor of Biology.*

HERBERT P. JOHNSON, PH.D. (Chicago),  
*Assistant Professor of Biology, and Curator of the Zoölogical Collections.*

H. B. TORREY, B.S.,  
*Laboratory Assistant in Biology.*

Primarily for Graduates.

1. Physiological Optics.

Professor LE CONTE.

2. General Laws of Animal Structure.

Professor LE CONTE.



3. Asexual Reproduction in Animals. *2 hrs., second half.*

Assistant Professor RITTER.

4. Special Research.

Students who are in position to carry on original investigations are given the benefit of every facility and encouragement at the command of the department.

The work done during the last few years, particularly on the marine invertebrate fauna of California, has served to reveal more and more clearly the richness, in many respects unique, of the opportunities here afforded for making important contributions to zoölogical science in its various aspects.

The museum collections are readily accessible to students pursuing advanced studies, and are particularly valuable to those who undertake investigations in systematic zoölogy.

Between the University library and the various libraries in San Francisco, particularly that of the California Academy of Sciences, the student is able to reach a greater part of the most important zoölogical literature. The results of studies that are carried sufficiently far to make them distinctly contributions to the science are published in the Proceedings of the California Academy of Sciences.

For Graduates and Advanced Undergraduates.

5. Studies in Systematic and Field Zoölogy.

Assistant Professor JOHNSON.

6. Comparative Embryology. *5 hrs., second half.*

Assistant Professor JOHNSON.

7. Zoölogical Seminary.

Assistant Professors RITTER and JOHNSON.

GEOLOGY AND MINERALOGY.

JOSEPH LECONTE, A.M. (Georgia), B.S. (Harvard), M.D. (New York), LL.D. (Georgia),  
*Professor of Geology and Natural History.*

ANDREW C. LAWSON, M.A. (Toronto), PH.D. (Johns Hopkins),  
*Associate Professor of Geology and Mineralogy.*

JOHN C. MERRIAM, PH.D. (Munich),  
*Instructor in Paleontology.*

WILLIAM SIDNEY T. SMITH, A.B.,  
*Fellow in Mineralogy.*

For purposes of training in research, there is probably nowhere a more inviting geological field than that which lies immediately at the gates of the University of California. In nearly all departments of



geology the problems offered to the student are varied and interesting. In the treeless region between Berkeley and Mount Diablo, and on the San Francisco and Marin peninsulas, there are magnificent illustrations of mountain structure, and the opportunities for acquiring skill in stratigraphy and in the interpretation of structural phenomena could scarcely be surpassed. The strata of the region are replete with Cretaceous and Tertiary fossils. The igneous rocks range in character from the most acid to the most basic, and include plutonic intrusives, dykes, and volcanic flows. In themselves and in the metamorphic contact zones, which they have developed in the adjoining country rock, they afford to the student of petrography abundant material for study. In dynamic geology the operation of wave, wind, and stream in the evolution of geomorphic form, is finely illustrated, as are, also, the phenomena due to vertical oscillations of the coast. The facilities for local field work are ample. The region adjacent to the Bay of San Francisco, from Mount Hamilton northward, is being mapped topographically by the United States Geological Survey, and excellent contour maps are becoming available as the work proceeds. These maps are made the basis for instruction in geological cartography.

In the wider field of the entire State, many broad and philosophic problems in geological science grow upon the student as he becomes familiar with the structure and physiography of the country. Movements of vast extent have occurred on the western margin of the continent in the most recent times, and the conditions for their study are most favorable. Such questions as are involved in the doctrine of isostasy and in the theories of orogeny and epeirogeny are constantly suggested to the student by his environment. The new science of geomorphology could scarcely find a more promising field for the concrete illustration of its principles. In the Sierra Nevada studies in glaciology may be pursued to very great advantage. In petrology and mineralogy a large and inviting field awaits the investigator. The economic geology of the State has as yet been but partially studied.

In palaeontology and historical geology, California offers unlimited material to the student desirous of engaging in research. Almost the entire geological column from the Cambrian to the Quaternary is represented by fossiliferous horizons; and, although valuable contributions to the palaeontology of the State have been made by Conrad, Gabb, and others, many of the more important problems relating to the geological position and faunal relations of the California formations are still unsolved.

The *laboratories* and *museums* of the department are well equipped for research, and new material and apparatus are being added yearly. A collection of minerals comprising nearly 20,000 specimens is at the disposal of the student. The petrographical collections contain representatives of nearly all the rock types.

The collection of fossils in the departmental museum represents fully the development of invertebrate life, and as a working collection is excelled by few in America. The material collected by the State Geological Survey, including the majority of Gabb's types, is in the collection, furnishing an almost complete set of species for comparison.

The activity in research during the past few years has led to the establishment of the BULLETIN OF THE DEPARTMENT OF GEOLOGY, of which thirteen numbers have been issued.

During the year 1896-97 Professor LECONTE will lecture on the following special topics: Mountain Structure, Organic Evolution in Geology, Quaternary Geology, The Glacial Epoch in California, Genesis of Metalliferous Veins.

Associate Professor LAWSON will conduct graduate work in inorganic geology, including discussions of special topics and advanced problems, critical reviews of current literature, prosecution of geological research with the view to publication of results, methods of geological surveying and cartography, and petrographical studies.

Dr. MERRIAM will conduct advanced instruction and research in palaeontology.

## MECHANICAL ENGINEERING.

FREDERICK GODFRAY HESSE (Graduate of Gewerbe Institut, Treves),  
*Professor of Mechanical Engineering.*

FREDERICK SLATE, B.S. (Brooklyn Polytechnic),  
*Professor of Physics.*

CLARENCE L. CORY, M.M.E. (Cornell),  
*Assistant Professor of Mechanical Engineering.*

J. N. LECONTE, M.M.E. (Cornell),  
*Instructor in Mechanical Engineering.*

LEVI F. CHESEBROUGH,  
*Instructor in Mechanic Arts.*

Graduate students who wish to engage in advanced work in Hydraulics, Thermodynamics, Experimental Engineering, Electrical Engineering, or related subjects, will be admitted to any of the Advanced Undergraduate Courses named below, on giving evidence that they possess the fundamental knowledge which will enable them to do justice to the instruction offered. They will also be given all possible assistance outside the lecture room in the pursuit of advanced study and original investigation. A new and well-equipped building is devoted to the work of this department.

1. Hydraulics and Hydraulic Machinery. 3 hrs., second half.

Professor HESSE.

MECHANICAL ENGINEERING—(CONTINUED).

2. Thermodynamics. *3 hrs., first half.*

Professor HESSE.

3. Dynamics of Heat Engines. *3 hrs., second half.*

Professor HESSE.

4. Experimental Engineering; Mechanical Laboratory. *6 hrs., throughout the year.*

Professor HESSE, Assistant Professor CORY, and Mr. LeCONTE.

5. Electrical Engineering.

(a) Alternating Currents and Alternating-Current Machinery.

*4 hrs., first half.*

(b) Electricity in Engineering and Principles of Electrical Installation. *4 hrs., second half.*

(c) Electrical Laboratory and Designing. *9 hrs., throughout the year.*

Assistant Professor CORY.

6. Special Reading and Research.

Professor HESSE and Assistant Professor CORY.

Courses offered in Mathematics and Physics by Professors STRINGHAM, HASKELL, and SLATE, may be advantageously taken in connection with course 6.

CIVIL ENGINEERING.

FRANK SOULE (Graduate U. S. Military Academy),

*Professor of Civil Engineering and Astronomy.*

A. O. LEUSCHNER, A.B.,

*Assistant Professor of Astronomy and Geodesy.*

H. I. RANDALL, B.S.,

*Assistant Professor of Civil Engineering.*

L. E. HUNT, B.S.,

*Assistant in Civil Engineering.*

W. W. FOGG, B.S.,

*Assistant in Civil Engineering.*

For advanced work in Civil Engineering the Laboratory has recently been furnished with a large selection of apparatus specially provided to make tests and original experiments upon the materials used in engineering construction.

Every facility will be offered to engineering students desiring to do advanced work to make use of this apparatus in prosecuting, under the direction of the department, any duly approved original and independent investigations.

14. Framed Structures.

Including such subjects as swing, suspension, cantilever, and arch bridges, and the continuous girder. More advanced work in designing the details of framed structures. *3 hrs., first half.*

Assistant Professor RANDALL.

15. Laboratory Experiments upon, and investigations concerning, the materials used in engineering construction. Practical tests of the theories of flexure. Tests of full-sized columns, girders, etc.

Professor SOULÉ.

MINING AND METALLURGY.

SAMUEL B. CHRISTY, Ph.B.,

*Professor of Mining and Metallurgy.*

ERNEST A. HERSAM, B.S. (Massachusetts Institute of Technology),

*Instructor in Metallurgy and Analytical Assistant.*

ERNEST H. SIMONDS, B.S.,

*Instructor in Assaying and Mill Assistant.*

FRANK RICHARDS,

*Laboratory Helper.*

Primarily for Graduates.

1. Ore-Dressing.

Theory of ore-separation. Discussion of the methods in use for separating coarsely and finely disseminated minerals, with particular reference to the treatment of gold and silver ores. *2 hrs., throughout the year.*

2. Research Work in Ore-Dressing and the Metallurgy of Gold and Silver. *Hours to be arranged with the head of the Department.*

For Graduates and Advanced Undergraduates.

The following courses, given as undergraduate courses at the University of California, are open to graduate students whose previous work in Science and Engineering has fitted them to undertake them :

Mining, four courses.

Metallurgy, six courses.

Assaying, two courses.

These courses require twenty-three hours work per week for each term, and include both lecture and laboratory work.

## MINING AND METALLURGY—(CONTINUED).

The attention of those who are desirous of fitting themselves for the mining and metallurgy of the precious metals is directed to these courses, as the libraries, laboratories, and museums of the University have been carefully designed to meet the needs of such students, and it is confidently believed that opportunities are offered in these lines which are not to be met with elsewhere.

## MECHANICAL DRAWING.

HERMANN KOWER, C.E. (Stuttgart),  
*Assistant Professor of Instrumental Drawing.*

### For Graduates and Advanced Undergraduates.

#### 1. Graphostatics.

Graphical analysis of stresses in engineering structures. *2 hrs., first half.* Assistant Professor KOWER.

#### 2. Construction.

Design of roof trusses, highway and railroad bridges, dams, etc. *9 hrs., throughout the year.* Assistant Professor KOWER.

## DECORATIVE AND INDUSTRIAL ART.

HENRY THOMAS ARDLEY, S.A.,  
*Associate Professor of Decorative and Industrial Art.*

### Primarily for Graduates.

#### 16. Ancient Art.

A course of illustrated lectures on ancient art and historic ornament. *1 hr., second half.* Associate Professor ARDLEY.

#### 17. Historic Design.

Advanced work in original design, based upon history. *6 hrs., each half.*

(All undergraduate art work in this department required for entrance.)  
Associate Professor ARDLEY.

#### 18. Antique and Life Drawing.

Drawing from full-figure reproductions of classic sculpture, and from life. *6 hrs., each half.*

(All undergraduate free-hand drawing required for entrance to this course.)  
Associate Professor ARDLEY.

## AGRICULTURE, HORTICULTURE, AND ENTOMOLOGY.

EUGENE W. HILGARD, PH.D. (Heidelberg), LL.D. (Columbia),  
*Professor of Agriculture and Agricultural Chemistry.*

EDWARD J. WICKSON, A.M. (Hamilton),  
*Associate Professor of Agriculture, Horticulture, and Entomology.*

ROBERT H. LOUGHRIDGE, PH.D. (Mississippi),  
*Assistant Professor of Agricultural Geology and Chemistry.*

CHARLES W. WOODWORTH, M.S. (Illinois),  
*Assistant Professor of Entomology.*

MYER E. JAFFA, PH.B.,  
*Instructor in the Agricultural Laboratory.*

GEORGE E. COLBY, PH.B.,  
*Instructor in the Viticultural Laboratory.*

ARTHUR P. HAYNE, PH.B.,  
*Graduate Assistant in Viticulture.*

### Primarily for Graduates.

1. Advanced course in the study of Soil Chemistry and Soil Physics, and their relations to natural vegetation and culture.

Professor HILGARD and Assistant Professor LOUGHRIDGE.

2. Advanced course in the study of Soil Areas and Soil Distribution in California; their derivation and cultural value.

Professor HILGARD and Assistant Professor LOUGHRIDGE.

3. The Influence of Climatic Conditions upon the Formation and Nature of Soils. *1 hr. lecture and 1 hr. laboratory work* (the former may be taken alone), *second term.*

Professor HILGARD.

4. Advanced instruction in Horticulture, with stated residence and observation at the University Experiment Station, including experiments in cross-pollination, studies of comparative economic values of cultivated plants, their adaptation to local climatic conditions, etc.

Associate Professor WICKSON.

### AGRICULTURAL LABORATORY.

5. Extended researches in General Agriculture, including special and original investigations of soils, alkalies, waters, foods, fruits, wines, sugars, etc.

Mr. JAFFA and Mr. COLBY.

This course is intended for graduate students, but may be undertaken by others having sufficient chemical knowledge and experience.



6. Advanced course in Zymology, with laboratory work, original investigations in bacteriology and fermentation.

Mr. HAYNE and Mr. COLBY.

This course is designed more especially for students who, after having completed their undergraduate work, wish to pursue some special branch of Viticulture or Oenology. The course will be made to suit the special needs of students, as most of it will be laboratory work.

### For Graduates and Advanced Undergraduates.

1. Chemistry and Physics of Soils.

Professor HILGARD and Assistant Professor LOUGHRIDGE.

3. Agricultural and Viticultural Laboratory.

Mr. JAFFA, Mr. COLBY, and Mr. HAYNE.

9. Parasitic Plant Diseases. Assistant Professor WOODWORTH.

10. Systematic Entomology. Assistant Professor WOODWORTH.

11. Structural Entomology. Assistant Professor WOODWORTH.

12. Entomological Laboratory. Assistant Professor WOODWORTH.

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### HIGHER DEGREES.

The higher degrees of the University are conferred under the following conditions :

A candidate for the degree of Master of Arts, Master of Letters, or Master of Science, must have obtained either the corresponding Bachelor's Degree from this University, or a degree which the proper Faculty accept as an equivalent, conferred by some other university or college of acknowledged good standing. His application must be made, through the Recorder, to the Faculty of the College in which he seeks his degree, and must contain a full statement of the studies upon which he proposes to base his candidacy. Upon approval of this application, a committee will be appointed to have supervision of his work, to conduct his examination, and to pass upon the original dissertation which he is to present. The course of study must cover a period of not less than one year, which must ordinarily be passed in residence at the University. Only in the case of graduates of this University may this requirement, in rare cases, be remitted, but the course of study must then be extended to two years.

#### HIGHER DEGREES—(CONTINUED).

A candidate for the degree of Doctor of Philosophy must be a graduate of this University, or of some other university or college of acknowledged good standing. He must pursue a course of study selected by himself, and approved by the proper Faculty, embracing one principal and two subsidiary subjects, and extending over a period of at least three years, one of which must ordinarily be spent at this University; but in cases where continuous residence is impossible, the course of study must be extended to at least four years, and the separate periods of residence must together amount to at least three academic terms. He must present to the proper Faculty for approval, previous to the final examination for the degree, a dissertation bearing on the principal subject of his course, and of such a character as to show his power to do original work. Special emphasis is laid upon this requirement, and the degree will in no case be given merely for the faithful completion of a course of study, however extensive. A knowledge of Latin, equal to that required for admission to the College of Letters in this University, will be insisted on in all cases.

The professional degrees of Mechanical Engineer, Mining Engineer, Metallurgical Engineer, and Civil Engineer, will be given under conditions which may be learned in detail from the heads of the appropriate departments, upon the completion of one year of successful professional work, in addition to a specified course of graduate study.

The above statements concerning the length of time which must be spent in graduate study by candidates for the higher degrees, are understood to apply to students who can give all their time to study. In the case of persons who desire to carry on graduate studies while engaged in some other occupation, a proportionately longer period will be required.

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